

The Correlation
Between
Infantile Mortality,
And
Social, Industrial, And Climatic
Conditions.

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Introduction.

Prior to the operation of the Civil Registration Act 1837 [An Act for the Registration of Births, Marriages, and Deaths in England 1836, (6 and 7 Wm. IV C. 86)] no national system of Birth and Death Registration existed. Our knowledge of the Vital Statistics of earlier years has been gleaned from Parish Registers and from the London Bills of Mortality.

The Bills of Mortality were commenced in 1592, towards the end of the reign of Queen Elizabeth, and continued with scarcely any interruption through the seventeenth and eighteenth Centuries. A study of these records, and of contemporary writings justifies the conclusion that child mortality before the beginning of the nineteenth century was very high throughout the country, that it was higher in the towns than in the rural districts, and that then as now, high infant

Table 1.

Births and Deaths according to London "Bills of Mortality"

Period	1730-49	1560-69	1770-89	1790-1809	1809-29
Total Births	315456	307395	349477	386393	477910
Total Deaths 0-5y	235807	193694	180058	159571	151794
Total Deaths 0-2y	190200	153886	140810	117070	112135
Total Deaths 2-5y	44887	39808	39248	42501	39659
Dying per c. 0-5y	74.5	63.0	51.5	41.3	31.8
Dying per c. 0-2y	60.3	50.1	40.3	30.3	23.6
Dying per c. 2-5y (Survivors)	19.9	26.0	18.8	15.8	10.8

Table 2.

England and Wales. 1891-1900.

District	London City	strand	Stepney	Liverpool	Merthyr Tydvil
Total Births	5382	4634	19569	51164	47434
Total Deaths 0-5y	2609	1965	7946	18964	13971
Total Deaths 0-2y	1847	1557	6587	15794	11962
Total Deaths 2-5y	762	408	1359	3170	2009
Dying % 0-5y	48.4	42.4	40.6	37.6	29.4
Dying % 0-2y	34.3	33.6	33.6	30.9	25.2
Dying % 2-5y	21.5	13.2	10.5	9.0	5.6

and child mortality was closely associated with certain social and economic conditions.

The mortality of London children during the eighteenth century, it may be noted, compares not unfavourably with the present day mortality in many parts of the country.

Before discussing the statistics of infant mortality, and its causes, it is desirable to call attention to certain considerations which have determined the plan of this essay, and the method of treating the subject.

Appreciation of the value of infant life, and active care for the physical welfare, and the intellectual advancement of its children, are late features in the mental and moral development of a nation. Their appearance is preceded by a long process of compulsory education, imposed upon an unwilling people by a dominant oligarchy.

The fecundity of a species depends upon the ease with which it can obtain its food, and its fertility depends upon the length of the period of the helplessness

and immaturity of its offspring, and upon the dangers to which the offspring is exposed.

In primitive times the fertility of man was low, nevertheless population tended to increase beyond the means of subsistence, so that many races instinctively resorted to the practice of systematic infanticide. Early in the world's history, children were encumbrances to be got rid of, in the present day, they are encumbrances to be avoided. With the dawn of civilisation, when man began to settle, and to cultivate the ground, he had a greater assurance of an abundant food supply. His life was less strenuous, and less exposed to danger, and a higher rate of fertility prevailed.

Incessant warfare in these early times interfered with agriculture. At this stage of development the militant side of primitive culture belonged to the men, and the industrial side to the women. Employment of women in industrial occupation is not a modern innovation, it is new in form, not new in

fact. The amount of labour done by women depended mainly upon the abundance or lack of food. The country was frequently devastated, and the growing crops burnt, so that periods of scarcity and famine were frequent. Population was restricted by privation, pestilence, and warfare, and child mortality was high.

In course of time orderly government was established, and a division of labour between the sexes was gradually arranged. So, for the first time, a home life provided the women with domestic duties. There was growth of trade and commerce, resulting in a progressive economic revolution, which tended to withdraw both men and women from the home, as work became organised in centres, the nucleus of future towns.

Meanwhile, there was a great and continuous increase in prosperity, and the population insensibly divided itself into urban and rural. The rural population, attracted by high wages, and physical comforts, flocked into the towns, and the depopulation of the rural districts began.

The towns became overcrowded, their inhabitants were badly housed, there was also almost a complete absence of elementary sanitary requirements, of a pure water supply, of any organised system of sewage disposal. In this way began the difference between urban and rural mortality. High urban mortality was due then, as now, to dense aggregation of population.

The birth rate in the towns was high, but the mortality there was also high, especially the mortality of children.

Finally came the era of immense industrial development, by which all the evil effects of town life were aggravated.

The slavery of industrial competition replaced the butchery of warfare. The economic value of women and children was recognised, and they were pressed into the industrial service, with complete disregard of their health and life.

During all this time, an insidious cleavage of the population, into three strata had been taking place - into an upper stratum - insignificant in number, but exercising an all-powerful influence, by reason of its wealth and education;

into a lower stratum, (numerically the largest, but poor and illiterate) and, into a middle class. The middle class gradually became more numerous and richer, more powerful, and more influential, and in this class the moral development of the nation became most conspicuous. In it a sense of moral responsibility, a high ethical standard, ^{exhibited} exerted itself, which, in turn, was impressed to a greater or less degree, on the rest of the nation. In it originated the efforts to ameliorate the condition of the poor, and to remedy the evils of industrial employment.

Conspicuous among the efforts it made, were the legislative enactments for the care and protection of young children. From the time of the passing of the first Poor-law, in the reign of Elizabeth, through the seventeenth and eighteenth centuries, down to the social legislation of last century, the Statute Book reveals a persistent, progressive determination, to improve the condition of infants and young children, by increased protection, by improved education, and by restriction of employment.

The legislation was, and is, educational. The progress made in the protection of young children has been slow, and whatever progress has been made, has only been accomplished by force majeure, by invoking the majesty of the law, and future progress will only be possible, by extension of the law, and by an extended provision of the machinery, by which that law may be enforced.

It is seen, therefore, that the status of child life has been improved in two ways - by the spontaneous initiation of a section of the community, and by the compulsory obedience of the whole community to an arbitrary, though imperfect, standard of conduct. The mass of the population, whatever be the reason, is devoid of a sense of parental responsibility, and the safety, health, and life, of the child depend upon the effective administration of man-made law.

The wave of prosperity, originating in the period of phenomenal industrial development, began to recede during the latter part of last century. It brought greater luxury, and greater

comfort, and left them, for these superfluities, once they are enjoyed, become indispensable necessities.

As long as man restricts his idea of what is essential to him to such objects as he can procure without effort, he acquires a high degree of fecundity, but whenever a craving for luxury is established, that craving must be satisfied.

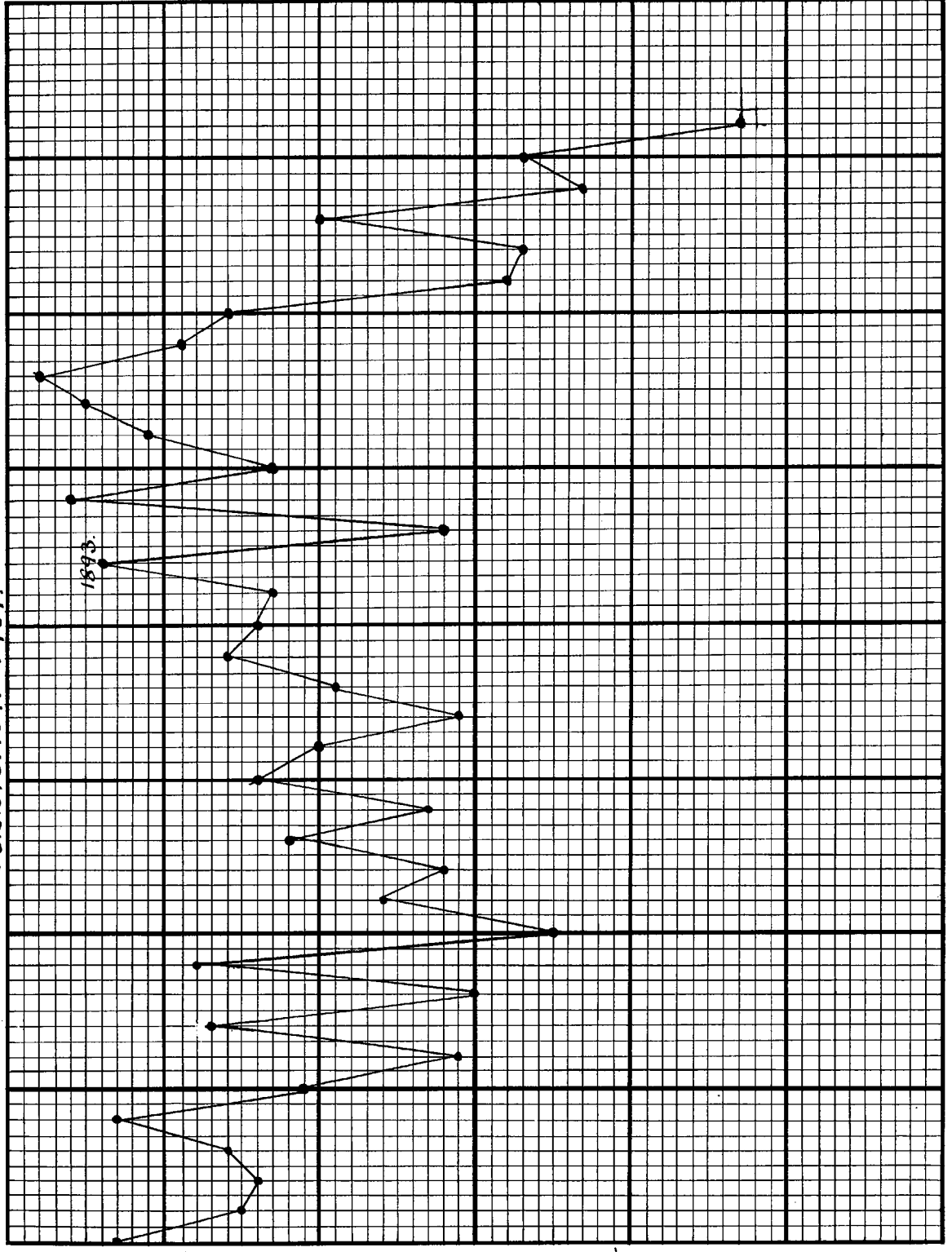
As soon as competition is necessary to acquire that luxury, then man, to avoid the necessity for increased effort, or diminished personal comfort, endeavours to reduce his burdens to a minimum, and he effects an economy in children.

This economy is in part effected by moral restraint, either by celibacy, or by later marriage, in part, by adopting artificial means to prevent conception. So that in a given race, at a given stage, of mental development, the population, and the number of births, tend to be proportionate to the quantity of productive labour, of which that race, at that stage of development, is susceptible.

And just as among animals, a species which produces many young

Chart 1.

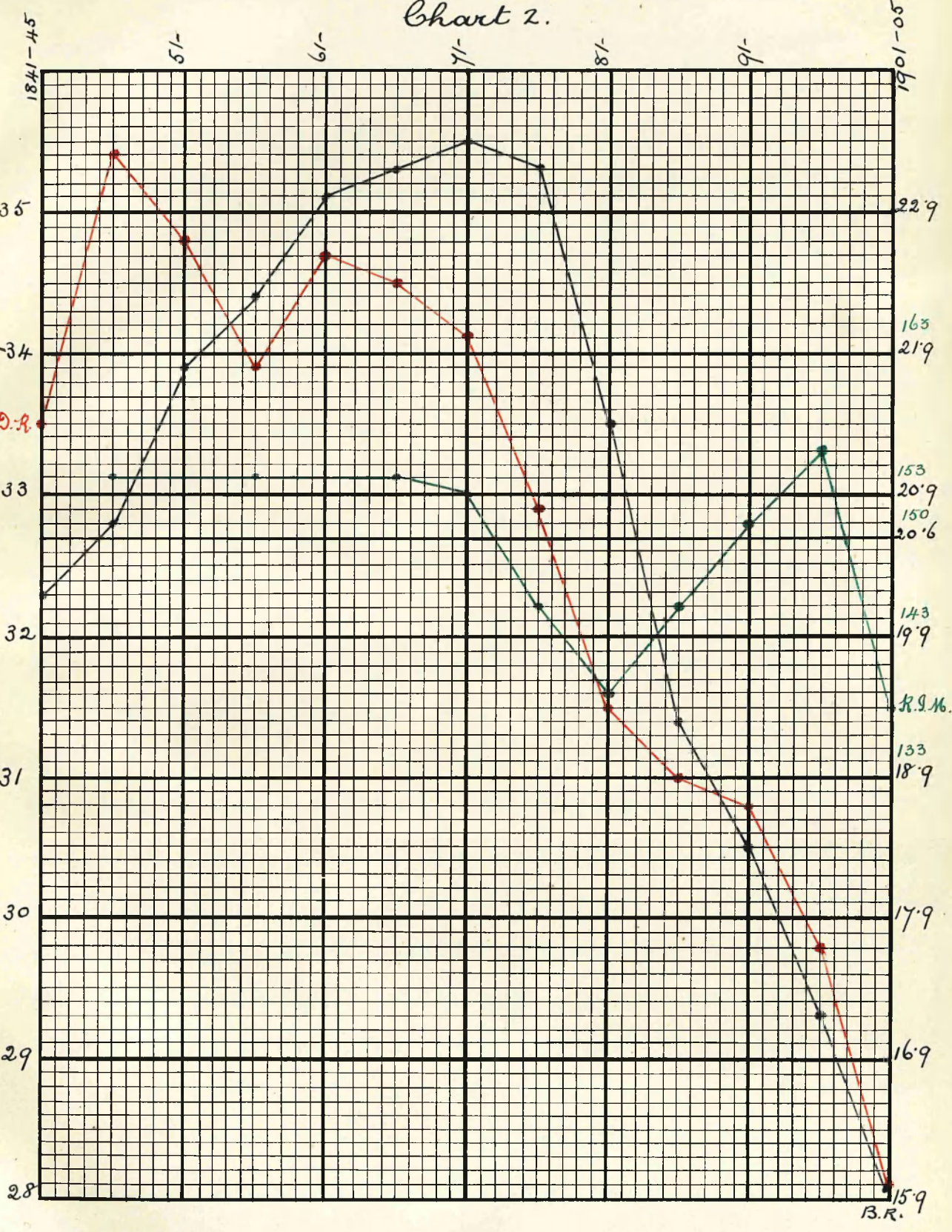
R. S. M. 1871-1907.



165 155 145 135 125 115

Chart 2.

R.I.M., Death Rates & Birth Rates 1841-45 / 1901-05.



takes little care of them, and a species which produces only a few, takes much care of them, so infant and child mortality is determined by the birth rate. And the birth rate in turn is proportionate to the prevailing standard of comfort, and the ease with which it is obtained.

Attention has recently been directed to the subject of infant mortality, by the continuous decrease in the Birth rate, which has been recorded since 1876, and by the fact, that until the present century, the Rate of Infant Mortality has remained practically stationary since the beginning of civil registration.

The causes to which the fall in the Birth Rate have been attributed are, a fall in the Marriage Rate, a later age at marriage, and the artificial prevention of conception. It has also been suggested that there is a diminished fecundity among women, depending upon their more general employment in industrial, and other occupations.

There has also been a fall in the general Death Rate at all ages, attributed in some measure to improved

sanitation. Much however of the decrease, is due to the influence of improved education, and to a higher standard of comfort, i.e. to individual, rather than organised influence. Every advance in sanitation, and hygiene, has primarily been directed to the security and comfort, of the adult population.

The inference to be drawn from the preceding argument is, that the insouciance, exhibited to-day towards the saving of child life, has always existed, and always will exist, among the mass of the population, unless that mass attain a higher educational, and ethical standard.

The present agitation and crusade, against high infant mortality is due, less to an unselfish and disinterested regard for the welfare of the child, than to the more selfish consideration, of national security.

The social legislation of last Century destroyed the economic value of the child, therefore the rate of fecundity diminished. The diminished fecundity has resulted in child life

being regarded as a valuable National asset, so that every effort will now be made to conserve that life; its economic value has been restored - but now the State is in loco parentis.

What influence this saving of child life will have upon National physique is beyond the province of this essay to discuss, but the birth rate will not rise to its former level, and possibly physical deterioration will ensue. (See Section 4. Summary)

Infant mortality at the present day is rarely the result of deliberate intention, but rather of ignorance and thoughtlessness. "Ah sinful nation: Israel doth not know. My people doth not consider. They refuse to know me." Saith the Lord.

The object of this essay is to attempt to show that the R.I.M. is determined by Social, Industrial & Climatic Conditions; and the following briefly outlines the method of treatment of the subject.

1. Proof that a falling Birth Rate is always associated with a falling Rate of Infantile Mortality, and with an increase in the Birth Rate, there is a coincident rise in the Rate of Infantile Mortality. (International Statistics. R.I.)
2. Having established that a general relation exists between Fertility and the R.I.M. investigation was made to ascertain whether any relation could be shown to exist between the fall observed in the two rates during recent years.
3. Having established (a) that high Fertility and high Infantile Mortality, and vice versa are associated together and (b) also that not only are the two rates causally related; but also that they are quantitatively related; it was next investigated whether any sufficient explanation of the relationship could be offered.
4. With this object in view, consideration was given to some of the chief factors concerned in influencing the relationship and which are here

enumerated:-

- (1). Social position, and Wealth.
- (2). Pauperism.
- (3) artificial and other restrictions on Birth Rate.
- (4). Consideration of the Economic value of the child, Employment in Factories.
- (5) Consideration of 3 important Social Conditions in relation to Fertility and Mortality viz:
 - (A). Illegitimacy.
 - (B). Marriage of Minors etc. and age at marriage
 - (C). Occupation of Women.

5. It was next investigated why the R.I.M. in England and Wales, remained high, and even increased, while the Birth Rate was diminishing.
6. Having shown that the explanation of the increased R.I.M. was due to climatic conditions, and therefore might be regarded as accidental;
7. It is pointed out in conclusion, that having established that the R.I.M. is determined by social, economic, and climatic conditions, and as a

Corollary it follows, that it is impossible to effect a direct reduction, for although such attempts may be of utility in themselves, and highly desirable; nevertheless, they must fail in arresting what is due to natural law.

Section 1.
1.

Reference to the International Vital Statistics, included in the Annual Reports of the Registrar General of England and Wales, shews that a falling birth rate is always attended with a falling rate of Infantile Mortality, and that, if an increase be recorded in the birth rate, there is also a coincident rise in the rate of Infantile Mortality. The statistics of some countries are either incomplete, or are unobtainable.

Using what statistics are available, and comparing the two quinquennia, 1881-1885, and 1901-1905, it is found that out of twenty-two countries, there was recorded a fall in the birth rate in eighteen, and an increase in four only, and a fall in the rate of Infantile Mortality, was recorded in sixteen countries, and a rise in six only.

The two countries in which a fall in the birth rate, and an increase in the rate of Infantile Mortality were recorded, are Russia, and Chili.

The statistics for these two

Table 3.

International Statistics.

Country	1. Birth Rates		3. Mortality Rates	4. Variation in Birth Rate 1881/85 to 1901/05	5. Variation in Birth Rate 1881/85 to 1901/05	6. Average Variation do	7. do ²	8. do _d , 1901/05	9. Variation in R.S. 16. 1881/85 to 1901/05	10. Average Variation do	11. do ²	12.
	1881/85	1901-05										
New South Wales	37.7	26.7	12.4	97	-11.0	8.3	68.89	149.4	-27	18	324	1
Victoria	30.8	24.9	12.2	96	-5.9	3.2	10.24	54.4	-26	17	289	2
Queensland	36.5	26.7	13.6	95	-9.8	7.1	50.41	227.2	-41	32	1024	3
Tasmania	34.9	28.9	10.9	90	-6.0	3.3	10.89	33.0	-19	10	100	4
New Zealand	36.3	26.6	9.0	75	-9.7	7.0	49.00	42.0	-15	6	36	5
Ceylon.	28.6	38.6	15.8	171	+12.0	14.7	216.09	323.4	+13	22	484	6
Jamaica	37.6	39.0	15.8	174	+1.4	4.1	16.81	102.5	+16	25	625	7
Denmark.	32.4	29.0	13.4	119	-3.4	0.7	0.49	4.2	-15	6	36	8
Norway.	31.2	38.6	9.8	81	-2.6	0.1	0.01	0.8	-17	8	64	9
Sweden	29.4	26.1	11.6	91	-3.3	0.6	0.36	9.6	-25	16	256	10
Russia	49.1	47.9	27.1	272	-1.2	1.5	2.25	15.0	+1	10	100	11
Finland	35.5	31.4	16.2	131	-4.1	1.4	1.96	30.8	-31	22	484	12
Prussia	37.4	34.9	20.7	190	-2.5	0.2	0.04	1.6	-17	8	64	13
France	24.7	21.2	16.7	139	-3.5	0.8	0.64	15.2	-28	19	361	14
Serbia	46.3	38.8	15.7	149	-7.5	4.8	23.04	4.8	-8	1	1	15
The Netherlands	34.8	31.6	18.1	136	-3.2	0.5	0.25	18.0	-45	36	1296	16
Belgium	31.1	27.7	15.6	148	-3.4	0.7	0.49	0.7	-8	1	1	17
Bulgaria	37.0	40.9	8.0	145	+3.9	6.6	43.56	488.4	+65	74	5476	18
Switzerland	28.6	28.1	17.1	134	-0.5	2.2	4.84	61.6	-37	28	784	19
Spain	36.4	33.3	19.2	173	-1.1	1.6	2.56	16.0	-19	10	100	20
Japan	26.0	31.8	10.3	154	+5.8	8.5	72.25	510.0	+51	60	3600	21
Chili	39.4	38.2	30.8	332	-4.2	1.5	2.25	49.6	+24	33	1089	22

$\frac{16594}{S_1} = 27$

$\frac{577.32}{S_0} = 5.1$

$\frac{59.8}{22} = 2.7$

$\frac{1888.1}{22 \times 5.1 \times 27} = 0.62$

$\frac{1}{\sqrt{N}} = \frac{1}{\sqrt{22}} \times 0.67 = 0.009$

$\gamma = 0.62 \pm 0.009$

countries are as under.

	Rate of Infant Mortality		Birth Rate	
	1881/85	1901/05	1881/85	1901/05
Russia	271	272	49.1	47.9
Chili	308	332	39.4	35.2

The increase in Russia is insignificant, and the Chilean statistics are open to criticism.

2.

Confining attention to the statistics of England and Wales, it was found that there was no relation between the annual variations in the rate of infantile mortality, and the birth rate. The statistics of the two rates are given in Table 4.

No relation was to be anticipated. The fall in the birth rate has been progressive. Reference will be made later, to the variations which have been recorded in the quinquennial rate of infantile mortality, during the past fifty years. (Section 4.)

The coefficient of correlation between the birth rates, and the rate

of Infantile Mortality (1871-1906) is, $r = 0.13 \pm 0.12$, shewing that mathematically, there is no interdependence between the annual variations.

3.

For the decennium, (1891-1900) the birth rate was 29.9, and the rate of infantile mortality 154.

For registration purposes the country is divided into 635 registration districts, which originally were identical with Poor-law Unions.

Registration districts are often distinct from both parliamentary and municipal divisions of the same name.

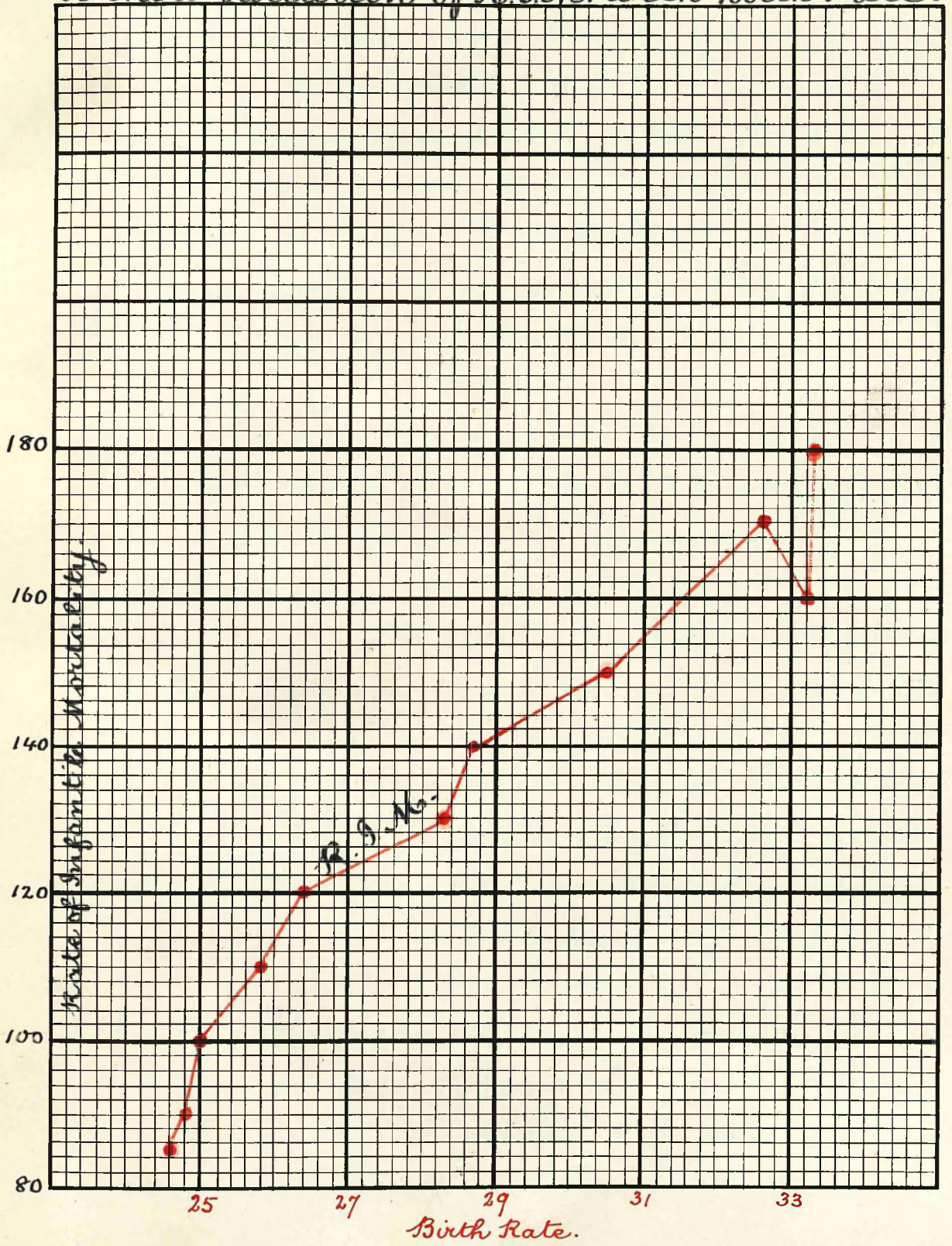
On analysing the statistics of these 635 divisions, the following table was obtained.

Table 4.

No. of Districts	R.S.M.	Mean Birth Rate	No. of Districts	R.S.M.	Mean Birth Rate
31	Under 90	24.6	49	141-	28.7
75	91-100	24.8	37	151-	30.5
111	101-	25.0	34	161-	33.2
92	111-	25.8	36	171-	32.6
77	121-	26.4	28	181-	33.3
65	131-	28.3	635	154	29.9

Chart 3.

To show variation of R. I. M. with Birth Rate.



It is seen from the figures in the above table, that the rate of infant mortality increases with the birth rate, in every group of districts except one. The birth rates were obtained from the total births, and total population, in each group of districts, and so it represents the mean birth-rate for each group. (See chart 3. p. 19.)

4.

The birth rate is not the most accurate method of estimating fertility, for it depends on, or is affected by, the age, and sex constitution, of a population. Fertility is better estimated by calculating as a rate per 1,000 married women, aged 15-45 years, or per 1,000 females living, between the same ages. The Registrar-General adopts the latter method, and I analysed the statistics of the English Counties for the decennium 1891-1900, to test the relation, if any, between fertility and infantile mortality, and the results obtained are summarised in the two tables which follow.

Table 5. (a)

No. of Counties	Fertility	Average R.I.M.	
4	139-159.	163	See fig: 1. Chart 4. (p. 22)
8	130-138	148	
13	120-129	137	
14	110-119	126	
6	93-109	124	

Table 5. (b)

No. of Counties	R.I.M.	Average Fertility	
9	161 & over	138	See fig: 2. Chart 4. (p. 22)
11	141-160	127	
12	121-140	115	
13	105-120	116	

It is seen that a high degree of fertility is found associated with a high rate of Infantile mortality, and vice-versa.

5.

I proceeded to analyse the statistics for two series of Registration districts, and lest any bias might be shown in the selection of districts, all those districts in which ~~in which~~ the decennial births exceeded 40,000 in number, were selected for the first series, and for the second series, all

Chart 4. (Figs 1. & 2.)

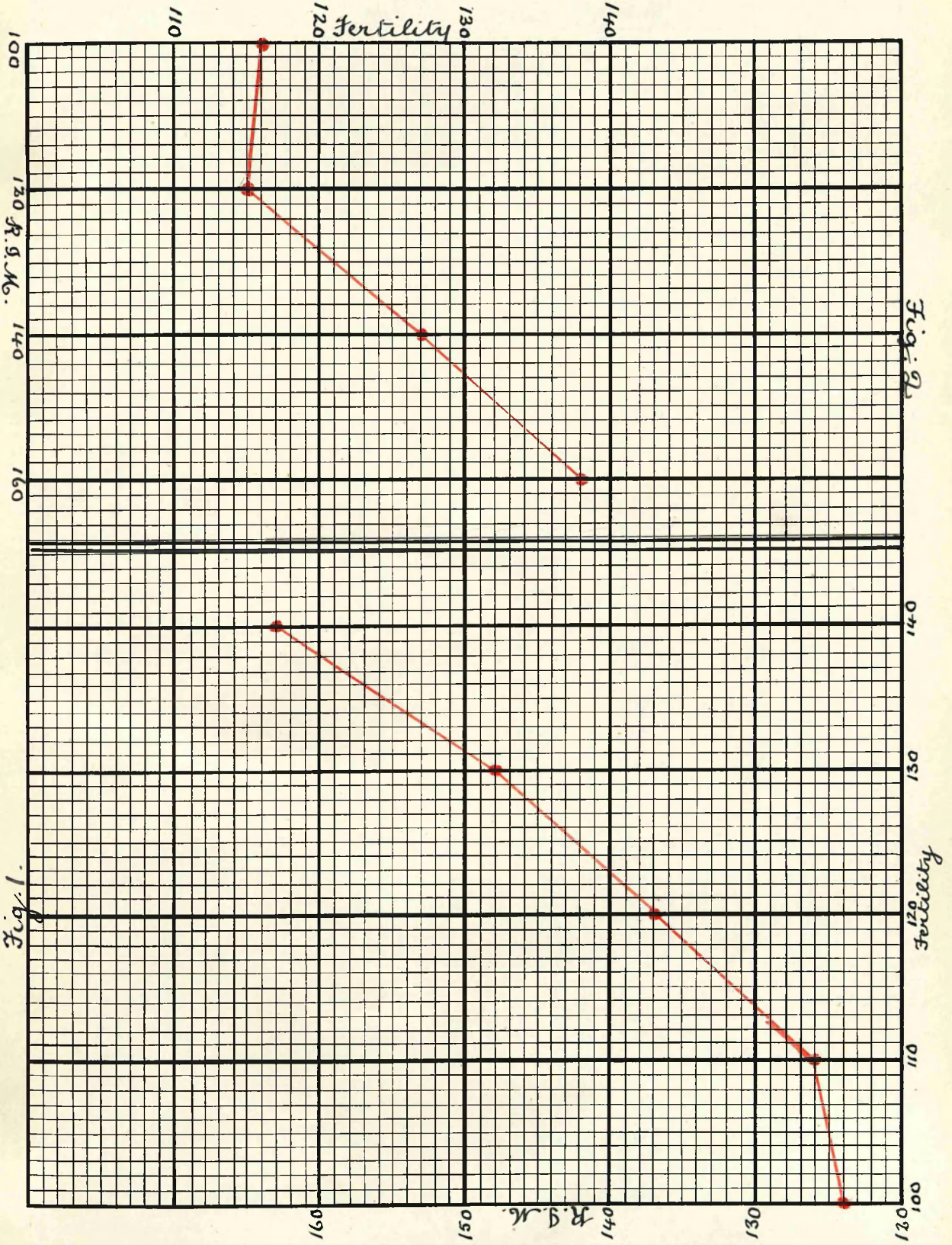


Table 6.

Districts with Decennial Births Exceeding 40,000 (R.G. Returns)

District	R.G. No.	d_0	d_0^2	Fertility	d_1	d_1^2	$d_0 d_1$
Manchester	211	39	1521	142	10	100	390
Merthyr Tydvil	202	30	900	176	44	1936	1320
Stockport	194	22	484	107	25	625	550
Ashton.	188	16	256	112	20	400	320
Shoreditch.	186	14	196	149	17	289	238
Dewsbury	177	5	25	106	26	676	130
Middlesborough	177	5	25	159	27	729	135
Barnsley	177	5	25	197	65	4225	325
Holborn.	178	6	36	142	10	100	60
Toxteth.	180	8	64	119	13	169	104
Bethnal Green.	161	11	121	158	26	676	286
Ecclesall B	163	9	81	119	13	169	117
Chesterfield	165	7	49	185	53	2809	371
Birkenhead	165	7	49	120	12	144	84
St. Olave	170	2	4	156	24	576	48
Brentford	152	20	400	100	32	1024	640
Portsmouth	159	13	169	112	20	400	260
Marylebone	133	39	1521	95	37	1369	1443
Broyden	135	37	1369	90	42	1764	1554
Mile End	143	29	841	157	25	625	725
Barton Regis	137	35	1225	109	23	529	805
Kings Norton	143	29	841	102	30	900	870
Preston	220	48	2304	120	12	144	576
Huddersfield	145	27	729	89	43	1849	1161
Halifax.	145	27	729	91	41	1681	1107
Liverpool	223	51	2601	131	1	1	57
Stoke	210	38	1444	157	25	629	950
Leicester	196	23	529	119	13	169	299
Wolverhampton.	188	16	256	152	20	400	320
Nottingham	186	14	196	106	26	676	364
Burnley	186	14	196	123	9	81	126
Sculcoates.	171	1	1	138	6	36	6
Wandsworth	147	25	625	105	27	729	675
Prestwich	171	1	1	122	10	100	10
Bradford	174	2	4	95	37	1369	74
Gateshead	174	2	4	163	31	961	62
West Bromwich	174	2	4	140	8	64	16
Dudley	177	5	25	175	43	1849	215
Oldham	178	6	36	110	22	484	182
Basford	162	10	100	157	25	625	250
South Shields	162	10	100	160	28	784	280
Tynemouth	173	1	1	137	5	25	5
Poplar.	169	3	9	156	24	576	72

continued on next page.

Table 6. cont'd

continued (Districts with Decennial Births exceeding 40,000)

District	R.I.M.	d_0	d_0^2	Fertility	d_1	d_1^2	$d_0 d_1$
Prescot	142	30	900	96	36	1296	1080
Greenwich	155	17	289	130	2	4	34
Blackburn	186	14	196	113	19	361	266
Pancras	164	8	64	112	20	400	160
Fulham	168	4	16	121	11	121	44
Sunderland	176	4	16	156	24	576	96
Salford	206	34	1156	137	5	25	170
Pontypridd	196	24	576	197	65	4225	1560
Sheffield	195	23	529	160	28	784	644
Newcastle	173	1	1	137	5	25	5
St Saviour	176	4	16	146	14	196	56
Bolton	176	4	16	124	8	64	32
Leeds	179	7	49	117	15	225	105
Wigan	179	7	49	174	42	1764	294
Bardiff	151	21	441	148	16	256	336
Camberwell	156	16	256	117	15	225	240
Hackney	149	23	529	105	27	729	621
Birmingham	200	28	784	134	2	4	56
Aston	178	6	36	137	5	25	30
Chorlton	180	8	64	111	21	441	168
Lambeth	151	21	441	121	11	121	231
Islington	148	24	576	109	23	529	552
West Ham	158	14	196	143	11	121	154

$\sum d_0^2 = 27292$
 $\sum d_1^2 = 45979$
 $\sum xy = 12810$
 Average Fertility = 132
 Average Mortality = 172

$r = 0.36 \pm 0.07$

Analysis	averages.	
	R.I.M.	Fertility
21 districts + m + f	186	156
20 " - m - f	151	108
15 " + m - f	188	114
10 " - m + f	161	156
averages	172	132
36 districts + m	187	138
30 " - m	155	124
35 districts - f	167	111
31 " + f	178	156

the districts in which the decennial number of births ranged from 10,000 to 20,000. There were 66 districts in the first group, and 91 in the second group. The districts are set forth in Tables 6. (p. 23 and 24) and 8. (p. 27, 28, + 29.)

The first series on analysis yielded the following tables.

66 Districts Decennial births 40,000 and over

Table 7.

No: of Districts	Range of Mortality	Average Fertility	
17	181 and over	138	See fig: 3. Chart 5. (p. 26)
21	171 —	138	
17	151 —	136	
11	131 —	104	

No: of Districts	Range of Fertility	Average Mortality	
18	151 and over	177	See fig: 4 Chart 5. (p. 26)
14	131 —	183	
18	111 —	174	
16	110 and under	156	

The association between fertility_x and infantile mortality_x is not so definitely shown by the above tables. A few districts however, with rates far removed

Chart 5. (Figs 3 & 4)

Fig: 4.

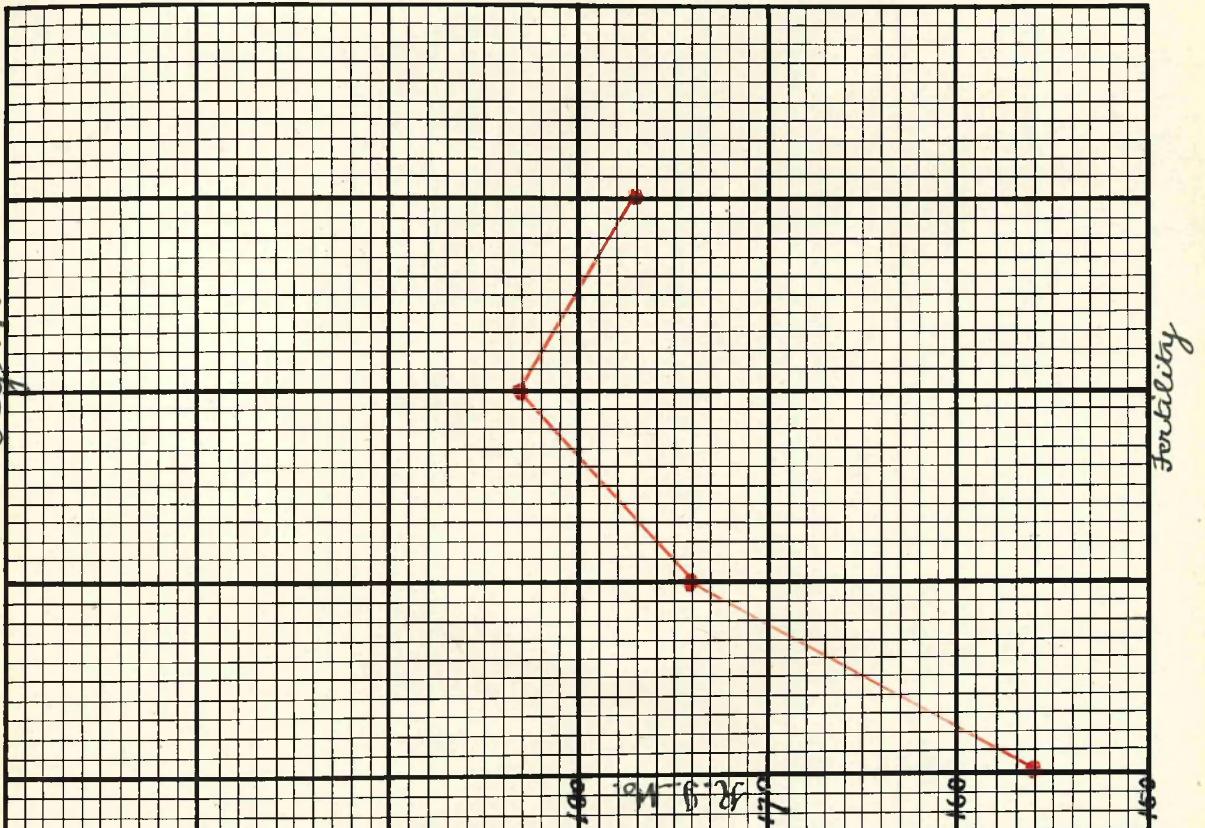


Fig: 3.

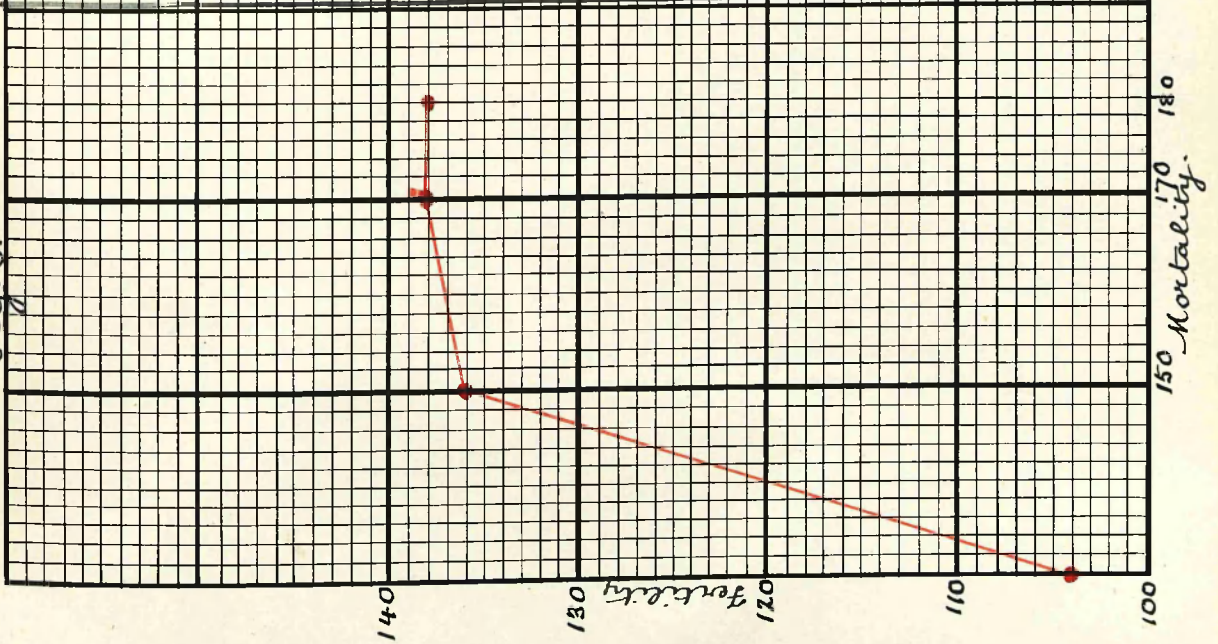


Table 8.

Districts with Decennial Births 10,000-20,000.

District	R.S.M.	d_0	d_0^2	Fertility	d_1	d_1^2	$d_0 d_1$
Warwick	125	12	144	84	34	1156	408
Wharfedale	121	16	256	97	21	441	336
Shardlow	127	10	100	137	19	361	190
Skipton	127	10	100	109	9	81	90
Holywell.	123	14	196	142	24	576	336
Guisboro.	138	1	1	137	19	361	19
Carlisle	136	1	1	116	2	4	2
Whitehaven	132	5	25	143	25	625	125
Pontypool	137	0	0	168	50	2500	0
Boston	137	0	0	127	9	81	0
Glanford Brigg	140	3	9	148	30	900	90
Bucklow	138	1	1	91	27	729	27
St Giles	131	6	36	97	21	441	126
Dover	136	1	1	114	4	16	4
Reading	138	1	1	117	1	1	1
Rochford	134	3	9	119	1	1	3
Northford	138	1	1	132	14	196	14
Keynsham	131	6	36	139	21	441	126
Cheltenham	134	3	9	76	42	1764	126
Leek	140	3	9	136	18	324	54
Kidderminster	139	2	4	101	17	289	34
Isle of Wight	100	37	1369	90	28	784	1036
Darlington	139	2	4	117	1	1	2
Recluth	185	48	2304	111	7	49	336
Kendal	103	34	1156	100	18	324	612
Barnet	106	31	961	90	28	784	868
Asbridge	110	27	729	86	32	1024	864
Barnstaple	114	23	529	104	14	196	322
Tendring	116	21	441	135	17	289	357
Wycombe	117	20	400	132	14	196	280
Bedford	117	20	400	95	23	529	460
Bromley	118	19	361	83	35	1225	665
Slaying	118	19	361	118	47	1681	779
Tonbridge	119	18	324	93	25	625	450
Swindon	119	18	324	150	32	1024	576
Wivral	119	18	324	101	17	289	306
Lincoln	157	14	196	115	3	9	42
Southampton	157	14	196	127	9	81	126
Runcorn	151	14	196	149	31	961	434
Barrow	152	15	225	142	24	576	360
Worksop	153	16	256	168	50	2500	800
Lancaster.	153	16	256	112	6	36	96

continued on next page.

Table 8 cont^d

Continued: (Districts with Decennial Births 10,000 - 20,000)

District	R.S.No.	d_0	d_0^2	Fertility	d_1	d_1^2	$d_0 d_1$
Boventry	154	17	289	124	6	36	102
Newcastle	156	19	361	159	41	1681	779
Ipwich	156	19	361	115	3	9	57
Northwich	158	21	441	176	58	3364	1218
Penzance	166	29	841	110	8	64	232
Chorley	166	29	841	124	6	36	174
Worpleth	169	32	1024	169	51	2601	1632
Houghton	172	35	1225	187	69	4761	2415
West Derby	174	37	1369	134	16	256	592
Yarmouth	175	38	1444	115	3	9	114
Basington	176	39	1521	195	77	5929	3003
Stepney	241	104	10816	148	30	900	3120
Watford	112	25	625	107	11	121	275
Guildford	113	24	576	102	16	256	384
Epsom	114	23	529	84	34	1156	782
Totnes	112	25	625	132	14	196	350
Worcester	163	26	676	112	6	36	156
Richmond	141	4	16	77	41	1681	164
Strood	146	9	81	163	45	2025	225
Phanet	146	9	81	85	33	1089	297
Kettering	146	9	81	146	28	784	252
Luton	142	5	25	108	10	100	50
Gloucester	141	4	16	121	3	9	12
Barnock.	145	8	64	185	67	4489	536
Ashby	143	6	36	147	29	841	174
Gainsboro.	168	11	121	138	20	400	220
Macclesfield	145	8	64	100	18	324	144
Keighley	147	10	100	98	20	400	200
Scarboro.	145	8	64	96	22	484	176
Llanelli	147	10	100	146	28	784	280
Barnarvon	145	8	64	116	2	4	16
Devonport	146	9	81	120	2	4	18
Hampstead	122	15	225	54	64	4096	960
Farnham	128	9	81	135	17	289	153
Maidstone	130	7	49	110	8	64	56
Elham	127	10	100	93	25	625	250
Hastings	125	12	144	71	47	2209	564
Eastbourne	123	14	196	77	41	1681	574
Christ Church	122	15	225	68	50	2500	750
South Stoneham	125	12	144	121	3	9	36
Wellingboro.	129	8	64	141	23	529	184
Peterboro.	130	7	49	125	7	49	49

continued on next page.

Table 8. cont^d
 continued. (Districts with Decennial Births 10,000 to 20,000)

District	R.I.M.	d_0	d_0^2	Fertility	d_1	d_1^2	$d_0 d_1$
St. Thomas	122	15	225	102	16	256	240
Newton Abbot	125	12	144	80	38	1444	456
Taunton	126	11	121	111	7	49	77
Bath	125	12	144	84	34	1156	408
Hereford	125	12	144	110	8	64	96
Atcham	123	14	196	110	8	64	112
Lichfield	126	11	121	153	35	1225	385
	3585		3082	3012		24048	4440
Average.	137			118			

$$\Sigma d_0^2 = 39181 \quad S_0 = 2328$$

$$\Sigma d_1^2 = 74709 \quad S_1 = 28.65$$

$$\Sigma d_0 d_1 = 24893$$

$$r = 0.41 \pm 0.06.$$

from the average affected the results, but one would not have felt justified in omitting any district.

I calculated the coefficient of correlation between the two rates, and found that $r = 0.36 \pm 0.07$, shewing that a considerable degree of correlation exists. The rates were both above, or both below, the average, in 41 districts or in 62 per. cent.

It may be added that, while high mortality is associated with high fertility, the converse is not so invariable, although very low fertility is associated with low mortality.

Districts with Decennial Births 10,000-20,000.

Table 9.

No: of Districts	Range of Mortality	Average Fertility	No: of Districts	Range of Fertility	Average Mortality
19	151 and over	140	10	151 and over	154
33	131 —	123	22	131 —	141
35	111 —	106	22	111 —	146
4	110 and under	91	22	91 — 110	138
			15	under 91	122

See fig: 5. Chart 6 (p 31)

See fig: 6. Chart 6 (p 31.)

The analysis of this group yields more

Chart 6. (Fig 586.)

Fig. 6.

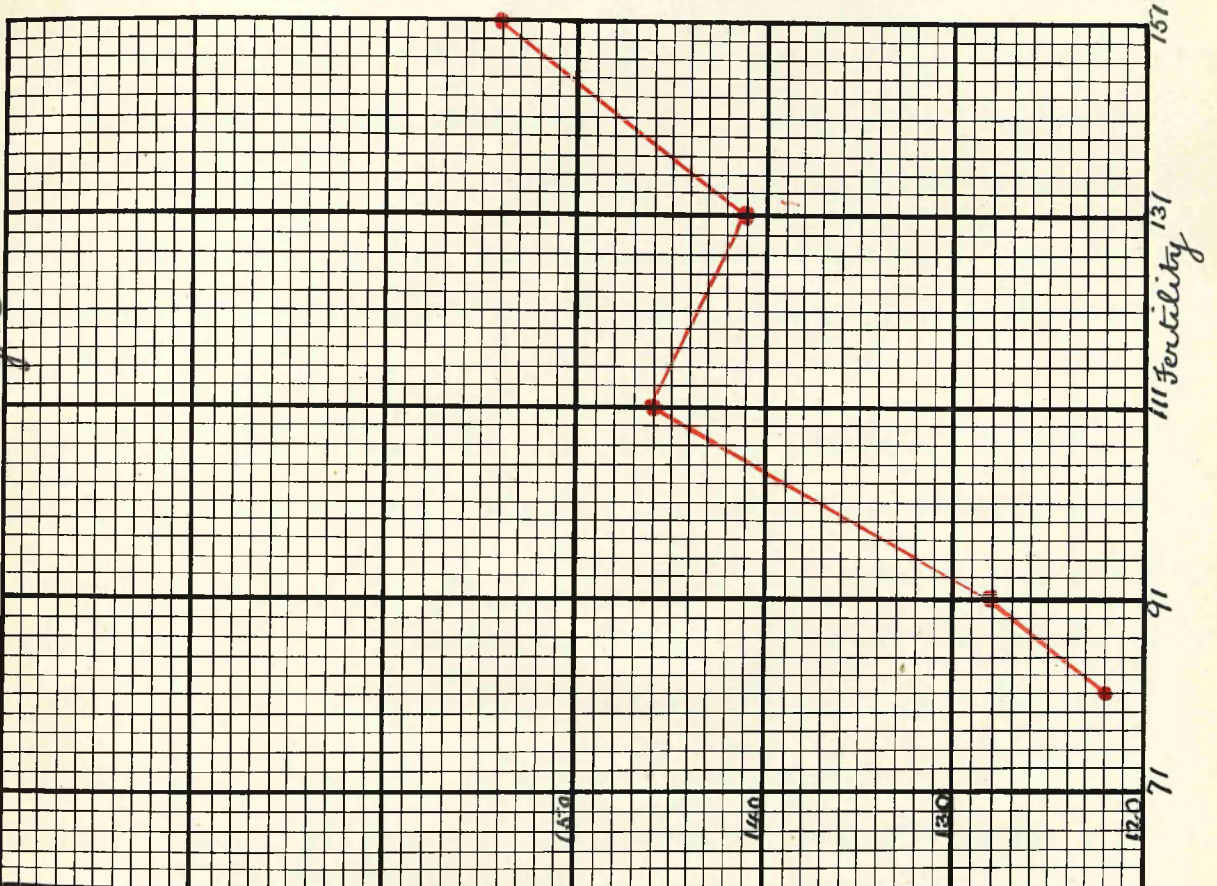
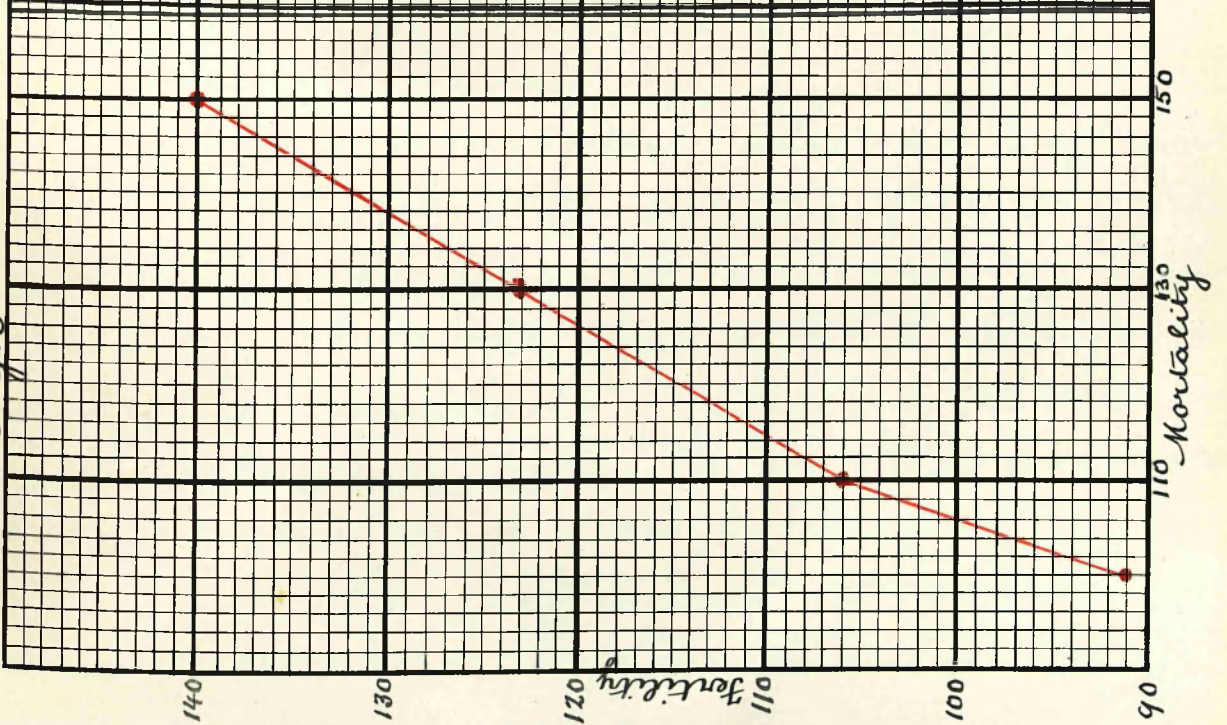


Fig. 5.



concordant results. The average mortality of 22 districts, with fertility rates ranging from 131 to 140, is the only exception to a regular series. It will be observed, that in these smaller districts the mortality is lower than in the larger districts, and the fertility is also lower.

The two rates were both above, or both below, the average in 59 cases, or 65 per. cent., and on calculation, the coefficient of correlation between the rates, was found to be, 0.41 ± 0.06 , a distinctly higher correlation than was found in the districts with the larger populations.

b.

I calculated also the coefficient of correlation between the fertility rates, and rates of infantile mortality, in the sixteen districts, into which Staffordshire is divided. The rates were both above, or both below, the average in 12 cases, or 75 per. cent. (p. 33)

The coefficient of correlation was 0.56 ± 0.12 , higher than in the previous two series.

Table 10.
Staffordshire Registration Districts
1891-1900.

Registration District.	Fertility	R.I.M.	d_0	d_0^2	d_1	d_1^2	$d_0 d_1$
Stafford	117	123	-31	961	-30	900	930
Stone	121	132	-27	729	-21	441	567
Newcastle	159	156	11	121	3	9	33
Wolstanton	163	188	15	225	35	1225	525
Stoke	157	210	9	81	57	3249	513
Leek	136	140	-12	144	-13	169	156
Cheddle	144	127	-4	16	-26	676	104
Uttoxeter	120	114	-28	784	-39	1521	1092
Burton	149	134	1	1	-19	361	-19
Tamworth	144	133	-4	16	-20	400	80
Lichfield	153	126	5	25	-27	729	-135
Cannock.	185	145	37	1369	-8	64	-296
Wolverhampton	152	188	4	16	35	1225	140
Walsall	158	184	10	100	31	961	310
West Bromwich	140	174	-8	64	21	441	-168
Dudley	175	177	27	729	24	576	648
Totals.	2373	2451		5381		12947	4480
Averages.	148	153					

In 12 districts the two rates were above or below the average = 75%.

9 districts Fertility rates high, average R.I.M. 167.5
 7 " " R.I.M. " low " " 136.1
 7 " " R.I.M. " high " " Fertility 157.8
 9 " " " " low " " 141.

$$\begin{aligned} \text{Fertility } S_0 &= 18 \\ \text{Mortality } S_1 &= 28 \end{aligned}$$

$$r = \frac{\sum d_0 d_1}{n \cdot S_0 \cdot S_1} = 0.555$$

$$p_2 = .67 \times \frac{1-r^2}{\sqrt{n}} = 0.117.$$

Table II.
England and Wales 1891-1900.

	R.I.M.	Fertility		R.I.M.	Fertil.		R.I.M.	Fertil.
E. and W.	153	123	Norfolk	142	126	Cheshire	156	118
Surrey	122	94	Wilts	102	123	Lancashire	179	123
Kent	129	112	Dorset	102	114	W. R.	164	122
London	160	113	Devon.	131	105	E. R.	166	130
Sussex	118	93	Cornwall	141	110	N. R.	146	130
Hants	127	109	Somerset	114	113	Durham	167	159
Berks	114	114	Gloucester	131	110	Northumb.	161	138
Middlesex	139	107	Hereford	112	119	Cumber.	130	130
Hertford	110	113	Salop	114	125	Westmor.	107	105
Bucks.	113	125	Stafford	172	153	Monmouth	152	159
Oxford	113	115	Worcester	141	117	S. Wales.	163	149
Northants	133	131	Warwick	169	129	N. Wales.	135	120
Hunts	118	125	Leicester	164	128			
Bedford	126	110	Rutland	110	111			
Camb.	124	121	Lincoln	142	126			
Essex	141	134	Notts.	164	134			
Suffolk	121	129	Derby	146	138			

In nine districts in which the fertility rates were higher than the average, the average rate of mortality was 167.5, compared with 136 in the seven districts, in which those rates were lower.

In nine districts in which the mortality rates were lower than the average, the fertility was 141, as compared with 158, in the seven districts in which the mortality rates were higher than the average.

7.

Having thus established, that a general relation exists between fertility and infantile mortality, I proceeded to investigate, whether any relation could be shown to exist, between the fall observed in the two rates during recent years.

8.

For that purpose I determined in the 22 countries of which statistics are available, what was the measure of the average variation recorded in the two rates, and then proceeded to calculate the coefficient of

correlation. The coefficient of correlation so calculated was found to be 0.62 ± 0.009 - a very degree of correlation from which it may be inferred, that not only are the two rates causally related, but, that they are also quantitatively related.

9.

I further compared the percentage fall in the two rates in English Counties, using the mortality statistics for the two quinquennia 1871-1875, and 1901-1905, and the fertility rates for 1870-1872, and 1903-1905.

In all the Welsh bounties, except Montgomeryshire, and Flintshire, an increase in mortality was recorded, and an increase also occurred in two English bounties, viz: Essex and Monmouthshire, (though the latter ought more properly to be included in the Welsh bounties.)

The analysis of the statistics of the forty-one bounties, in which a fall in mortality was recorded, yields the following table.

41 English Registration Counties.

Table 12.

No. of Counties	Fall in Fertility	Fall in Mortality	No. of Counties	Fall in Mortality	Fall in Fertility
14	under 20%	11%	12	under 10%	21.6
16	20 - 25	14%	12	10 - 15	21.1
11	25 & over	18%	8	15 - 20	23.0
			9	over 20%	26.2

10.

Using the data for the fifty-five registration counties, into which England and Wales is divided, the coefficient of correlation between the percentage decreases in the rates, is found to be, $r = 0.386 \pm 0.067$, while if the Welsh statistics be excluded, the coefficient of correlation for forty-three English counties is, $r = 0.51 \pm 0.08$.

Registrar Generals Returns 1906 XXV

Table 13.

County.	Fertility ± % 1870-2 1903-05	R.I.M. ± % 1871-75 1901-05	d ₀	d ₀ ²	d ₁	d ₁ ²	d ₀ d ₁
London	19.2	13.0	-3.6	13.0	10	1.0	3.6
Surrey	24.4	8.7	1.6	2.6	-5.3	28.1	8.5
Kent	25.7	4.8	2.9	8.4	9.2	84.6	26.7
Sussex	31.7	12.9	8.9	79.2	1.1	1.2	9.8
Hants.	23.3	5.2	0.5	0.2	8.8	77.4	4.4
Berks.	26.3	15.1	3.5	12.2	1.1	1.2	3.8
Middlesex	19.6	10.4	-3.2	10.2	3.6	13.0	11.5
Herts.	25.1	28.1	2.3	5.3	14.1	198.8	32.4
Bucks.	22.9	24.0	0.1	0.0	10.0	100.0	1.0
Oxford	24.4	25.0	1.6	2.6	11.0	121.0	17.6
Northants.	33.0	24.3	10.2	104.0	10.3	106.1	105.1
Hunts.	22.8	25.2	0	0	11.2	125.4	0
Beds.	30.2	28.4	1.4	2.1	14.4	207.4	20.2
Camb.	25.1	21.3	2.3	5.3	7.3	53.3	16.8
Essex	22.2	+0.8	-0.6	0.4	14.8	219.0	8.9
Suffolk	20.4	11.9	-2.4	5.8	2.1	4.4	5.0
Norfolk.	19.0	15.8	-3.8	14.4	1.8	3.2	6.8
Wilts.	24.3	18.0	1.5	2.2	4.0	16.0	6.0
Dorset	23.5	14.8	0.7	0.5	0.8	0.6	0.6
Devon.	28.3	4.8	5.5	30.2	5.2	27.0	28.6
Bornwall	30.7	19.3	7.9	62.4	5.3	28.1	41.9
Somerset	24.9	22.1	2.1	4.4	8.1	65.6	17.0
Gloucester	23.0	15.6	0.2	0.0	1.6	2.6	0.3
Salop	15.7	16.0	-7.1	50.4	2.0	4.0	14.2
Stafford	19.9	7.9	-2.9	8.4	6.1	37.2	17.7
Wores.	24.2	13.3	1.4	2.0	0.7	0.5	1.0
Warwick.	19.5	9.0	-3.3	10.9	5.0	25.0	16.5
Leicester	27.7	23.5	4.9	24.0	9.5	90.2	46.3
Rutland	26.5	19.8	3.7	13.7	5.8	33.6	21.5
Lincoln	23.7	6.4	0.9	0.8	7.6	57.8	6.8
Notts.	15.8	9.5	-7.0	49.0	4.5	20.2	31.5
Derby.	20.7	8.3	-2.1	4.4	5.7	32.5	12.0
Hereford	19.0	10.6	-3.8	14.4	3.4	11.6	12.9
Cheshire	23.4	6.8	0.6	0.4	7.2	51.8	4.3
Lancs.	24.3	10.1	1.5	2.2	3.9	15.2	5.8
West Riding	27.7	13.6	4.9	24.0	0.4	0.2	2.0
East Riding	19.5	11.8	3.3	10.9	2.2	4.8	7.3
North Riding	18.0	4.1	4.8	23.0	9.9	98.0	47.5
Durham	15.9	11.2	6.9	47.6	2.8	7.8	19.3
Northumberland	16.5	7.4	6.3	39.7	6.6	43.6	41.6
Cumberland	18.3	11.2	4.5	20.2	2.8	8.4	12.6
Westmorland	30.6	16.0	7.2	51.8	2.0	4.0	14.4
Monmouth	5.1	2.9	17.7	313.3	16.9	285.6	299.1

$\frac{982.2}{43}$ $\frac{581.5}{43}$
 averages 22.8 = 14.0
 $r = 0.51 \pm 0.08.$

1096.4 2117.0
 50 = 5 51 = 7 773.0

Table 14.
County Statistics 1891-1900.% Variation ~~Decreases~~.

	Fertility	R. I. M.	Fertility	R. I. M.	d_0^2	d_1^2	$d_0 d_1$
England and Wales.	21.9	9.8	d_0	d_1			
London.	19.2	13.0	2.7	3.2	7.29	10.24	864
Surrey	24.4	8.7	2.5	1.1	6.25	1.21	2.75
Kent.	25.7	4.8	3.8	5.0	14.44	25.00	1900
Sussex	31.7	12.9	9.8	3.1	96.04	9.61	30.38
Hants.	23.3	5.2	1.4	4.6	1.96	21.16	6.44
Berks.	26.3	15.1	4.4	5.3	19.36	28.09	23.32
Middlesex	19.6	10.4	2.3	0.6	5.29	.36	1.38
Herts.	25.1	28.1	3.2	18.3	10.24	334.89	58.56
Bucks.	22.9	24.0	1.0	14.2	1.00	201.64	14.20
Oxford	24.4	25.0	2.5	15.2	6.25	231.04	38.00
Northants	33.0	24.3	11.1	14.5	123.21	210.25	160.95
Hunts	22.8	25.2	0.9	15.4	.81	237.16	13.86
Beds.	30.2	28.4	8.3	18.6	68.89	345.96	154.38
Bamb.	25.1	21.3	3.2	11.5	10.24	132.25	36.80
Essex	22.2	+0.8	0.3	10.6	.9	112.36	3.18
Suffolk.	20.4	11.9	1.5	2.1	2.25	4.41	3.15
Norfolk	19.0	15.8	2.9	6.0	8.41	36.00	17.40
Wilts.	24.3	18.0	2.4	8.2	5.76	67.24	19.68
Dorset	23.5	14.8	1.6	5.0	2.56	25.00	8.00
Devon.	28.3	4.8	6.4	5.0	40.96	25.00	32.00
Cornwall	30.7	19.3	8.8	9.5	77.44	90.25	83.60
Somerset	24.9	22.1	3.0	12.3	9.00	151.29	36.90
Gloucester	23.0	15.6	1.1	5.8	1.21	33.64	6.38
Hereford	19.0	10.6	2.9	0.8	8.41	.64	2.32
Salop.	15.7	16.0	6.2	6.2	38.44	38.44	38.44
Stafford	19.9	7.9	2.0	1.9	4.00	3.61	3.80
Worcs	24.2	13.3	2.3	3.5	5.29	12.25	8.05
Warwick	19.5	9.0	2.4	0.8	5.76	.64	1.92
Leicester	27.7	23.5	5.8	13.7	33.64	187.69	79.46
Rutland	26.5	19.8	4.6	10.0	21.16	100.00	46.00
Lincoln	23.7	6.4	1.8	3.4	3.24	11.56	6.12
Notts.	15.8	9.5	6.1	0.3	37.21	.9	18.3

continued on next page.

Table 14. cont'd
Continued - County Statistics 1891-1900.

	% Variation		Regression				
	Fertility	R. S. M.	d_0 Fertility	d_1 R. S. M.	$d_0 d_1$	d_0^2	d_1^2
Derby	20.7	8.3	1.2	1.5	1.80	1.44	2.25
Cheshire	23.4	6.8	1.5	3.0	4.50	2.25	9.00
Lancs.	24.3	10.1	2.4	.3	.72	5.76	.9
W. Riding	27.7	13.6	5.8	3.8	22.04	33.64	14.44
E. Riding	19.5	11.8	2.4	2.0	4.80	5.76	4.00
N. Riding	18.0	6.1	3.9	5.7	22.23	15.21	32.49
Durham.	15.9	11.2	6.0	1.4	8.40	36.00	1.96
Northumberland	16.5	7.4	5.4	2.4	12.96	29.16	5.76
Cumberland	18.3	11.2	3.6	1.4	5.04	12.96	1.96
Westmorland	30.6	16.0	8.7	6.2	53.94	75.69	38.44
Monmouth.	5.1	2.9	16.8	12.7	213.36	282.24	161.29
Glamorgan.	14.1	5.3	7.8	15.1	117.78	60.84	228.01
Barnarthen.	17.4	18.3	4.5	28.1	126.45	20.25	789.61
Pembroke	18.8	3.6	3.1	13.4	41.54	9.61	179.56
Cardigan	23.0	25.3	1.1	35.1	38.61	1.21	1232.01
Brecon	11.0	0	10.9	9.8	106.82	118.81	96.04
Radnor	21.2	4.0	0.7	13.8	9.66	.49	190.44
Montgomery.	19.0	6.14	2.9	3.4	9.86	8.41	11.56
Flint	11.5	2.23	10.4	12.5	130.00	108.16	156.25
Denbigh	13.8	3.0	8.1	12.8	103.68	65.61	163.84
Merioneth	25.0	9.2	3.1	19.0	58.90	9.61	361.00
Barnarvan	25.7	7.9	3.8	17.7	67.26	14.44	313.29
Anglesey.	17.4	20.2	4.5	30.0	135.00	20.25	900.00

$$\Sigma xy = 1345.58$$

$$\Sigma d^2 F = 1603.90$$

$$\Sigma d^2 M = 755.26$$

$$S_0 = 5.4$$

$$S_1 = 11.72$$

$$r = 0.386 \pm 0.067.$$

Table 15.

Welsh Counties % Variation Fertility and Mortality $\frac{1870}{1903}$ $\frac{1881}{1901}$

County	18-2 Fertility	Mortality	d_0	d_0^2	5.7 d_1	d_1^2	$d_0 d_1$
Glamorgan.	14.1	5.3	4.1	16.8	0.4	0.2	1.6
Cardiff.	17.4	18.3	0.8	0.6	12.6	158.8	10.1
Pembroke	18.8	3.6	0.6	0.4	2.1	4.4	12.6
Gardigan.	23.0	25.3	4.8	23.0	19.6	384.2	94.1
Brecknock.	11.0	0	7.2	51.8	5.7	32.5	41.0
Radnor	21.2	4.0	3.0	9.0	1.7	2.9	5.1
Montgomery	19.0	6.4	0.8	0.6	12.1	146.4	9.7
Flint	11.5	22.3	6.7	44.9	28.0	784.0	187.6
Denbigh	13.8	3.0	4.4	19.4	2.7	7.3	11.9
Merioneth	25.0	9.2	6.8	46.2	3.5	12.2	23.8
Cardarvon	25.7	7.9	7.5	56.2	2.2	4.8	16.5
Anglesey.	17.4	20.2	0.8	0.6	14.5	210.2	11.6

$$\frac{2179}{12} = 18.2 \quad \frac{68.4}{12} = 5.7 \quad \frac{269.7}{S_0} = 4.74 \quad \frac{1747.9}{S_1} = 12 \quad \frac{327.4}{S_1} = 12$$

$$r = 0.48 \pm 0.15.$$

The p.e. is very high. Less reliance is therefore to be placed on these figures. The increase in mortality in Wales is significant, indicating a change in habits. It may be accounted for perhaps, (1) by the development of industries, and, (2) by the Anglification of the Principality. (Liverpool, Birmingham etc residents going there, to live.) (3) Many of the farms are being converted into lodging-houses, and this in turn, probably involves neglect of children.

Table 16.

List of exceptions to the Law $\left\{ \begin{array}{l} \text{High fertility + high I. Mortality} \\ \text{Low " " + low " "} \end{array} \right.$
 Districts with high Fertility and low. Infant Mortality

District.	R. I. M.	Fertility	Birth Rate	Death Rate in Standard Population	Series
Dunmow	90	134	24.29	12.38	A.
Newent	94	146	28.07	12.69	B.
Clebury Mortimer	95	146	27.31	11.99	B.
Bricklade	99	147	28.64	13.67	B.
Hoxne	103	157	28.56	11.69	C.
Clutton	105	162	30.94	13.32	C.
Whitchurch (Hants)	111	148	31.30	13.07	D.
Swindon	119	150	32.01	14.64	D.
Westbury (on S)	120	167	31.47	14.33	D.
Market Bosworth	127	171	33.13	14.58	E.
Orsett	128	169	31.87	14.41	E.
Pontypool	137	168	35.20	16.96	F.
Tadcaster	139	160	33.74	16.78	F.

Table 17.

Districts with low Fertility and high Mortality

London City	225	61	16.62	39.35	K.
Strand	248	64	18.72	34.96	K.
Kensington	173	60	21.61	20.69	J.
Bradford	174	95	26.34	21.54	J.
Bury	172	99	26.36	21.89	J.
Brighton	164	91	25.64	18.59	I.
Chelsea	168	97	27.14	21.37	I.
St George. Hs.	158	62	20.23	21.59	H.
Paddington	159	72	23.99	19.18	H.
Westminster	144	75	21.99	16.97	G.
Huddersfield	145	89	23.92	19.12	G.

Section 2.

I have I think, proved that high fertility, and high infantile mortality - et vice versa - are associated together, and, that the relation between fertility and mortality, is not merely casual.

It has now to be considered, whether any sufficient explanation of the relationship can be offered.

1. It is almost unnecessary to prove that fertility is less, among the higher orders of Society, than among the lower, but the following statistics - the more valuable, because they date back to a period before the birth rate began to fall - may be quoted.

(a) Norway - 1851-60 (Bertillon.)

100 rich families = 313 children.

100 middle class " = 360 "

100 poor " " = 370 "

(b) Drysdale - 1888

100 Women Montmartre (Paris Work-people)
= 175 children.

100 Women - Champs Elysées quarter
= 86 children.

(c) Bertillon.

The following table is quoted from Mulhall's Dictionary of Statistics.

Yearly Births per 1000 Women.

Table 18.

Social status.	Paris	London	Berlin	Vienna
Rich	44	55	55	89
Comfortable	68	107	105	154
Poor	102	143	143	182
All classes.	80	109	102	153.

(d) A similar inference may be drawn from the statistics of the different wards, into which towns are divided, but such an inference would need to be confirmed, by a comparison of the age and sex constitution, of the population in the two districts.

City of Liverpool. 1901-05.

Table 19.

	Birth Rate	R.I.M.	Persons per acre
One working-class division.	41.4	229	134.2
One wealthy residential division	19.4	117	29.1

Table 20.

Borough of Southport. 1901-05.

	Birth Rate	R.I.M.
Six business wards	15.31	143
Two working class wards.	30.92	142
One wealthy residential ward	5.61	96
One rural ward	23.33	118.

Doubleday formulated a law of population - that fertility diminished with the ease with which a supply of food is obtained, i.e. with wealth, and the above statistics tend to substantiate his view.

2. It is axiomatic, that the heavier the purse, the lighter the mortality.

In 1843, (Report on the Sanitary condition of the Metropolis.) it was found, that the mortality among the infants of parents belonging to the professional classes, was only 1 in 10, of tradesmen 1 in 6, and of the working classes 1 in 4.

In 1874 Ansell, ("Statistics of Families") showed, that the rate of infant mortality among the professional classes, was only 80, as compared with 150 among the non-professional classes.

More recent statistics (Rowntree "Poverty" 1901.) yield the following table.

City of York. Table 27.

	R. I. M.
Poorest working classes	247
Middle " "	184
Highest " "	173
Servant Keeping "	94
City of York	176

Statistics might easily be multiplied to illustrate further, the relation between mortality and poverty.

3. In all trades for which records are available, the rate of wages shews a very material rise during the past half century. Subject to periods of fluctuation, there has been a persistent tendency to increase in the remuneration of labour since 1850, ("Public Health and Social Conditions". Local Government Board Report. 1909.) The net result of the successive changes in the rate of general wages, is an apparent increase of over 80 per. cent., in the average rate between 1850 and 1907. But the comparison of single years, cannot properly be pressed to support this inference. Comparison can only be drawn between averages, calculated over a course of years. The average rate of wages 1900-07, was to the average rate 1860-67 as 140 : 100 ; in other words, wages have risen in the forty years, by 40 per. cent.

Moreover, taking a large number

of the principal articles of common use, and averaging the wholesale prices, it is found that the average of prices, in the period 1897-1907, is 24 per. cent. lower, than in the period 1850-1860.

The real increase in wages is therefore materially greater, than in the bare rate of money wages, when the purchasing power of money, as measured by the average price, is taken into account.

[Rents have probably, on an average, increased since 1850, but no reliable data exist for ascertaining the extent of the increase.]

4. Pauperism, measured by the standard of population, has declined appreciably since 1850, and the improvement is seen to be even greater, if the special classes of lunatic, and idiot poor, and of casual, or vagrant poor, be excluded.

England and Wales.

Average daily pauperism per 1,000 estimated population.

	Including Insane and Casual Poor	Excluding Insane and Casual Poor
1850-9	49.2	48.0
1870-9	36.4	34.0
1890-9	26.4	23.4
1900-8	25.3	21.9

Table 22.

Further, the proportion of population to be found at the middle, and later ages of life, is increasing, owing to the decline in the birth rate, and other causes. This is a factor which of itself, militates against a continuous reduction, of the number of persons needing public assistance.

The increase in the rate of wages, and the decline in pauperism indicate, that the general population has attained a higher standard of comfort, and luxury, than formerly, a condition which conduces to low mortality.

Coincidentally with the growth of comfort, a continuously declining birth-rate is being recorded, and whether it is assumed that the association between low fertility, and low mortality, depends upon the latter, being both directly related to increased wealth, and desire for comfort, or, whether it is suggested, that the low mortality, associated with low fertility, is due to the increased attention which has been given to the protection

of child life during recent years, and to the administrative measures which have been taken, with the object of saving the waste of infant life, the two explanations, resolve themselves into one more comprehensive explanation, i.e., fertility and mortality, are determined by the economic value of the child, and the relation of the child to the comfort of the parent. How important is the economic value of the child, may be gathered from the following figures.

At the present time there are three sections of child workers —

- (1) "Half-timers", from 12 to 14 years of age.
- (2) Children, between 13 and 14 years of age, who have qualified as young persons, and work full time, and,
- (3) Young persons, from 14 to 18 years of age.

In 1906, 385,415 children and young persons, applied ^{for} and obtained, medical certificates for employment in factories. Of this number, 201,143 were boys, and 184,272 were girls, and 42,049 were "half-timers", of whom 20790

were boys, and 21,259 were girls. Of the 385,415 children, 79,158 were between 13 and 14 years of age, and were granted certificates for full employment.

In addition, at least 200,000 children at school ages, are in receipt of wages (excluding those in irregular employment, and also those not in receipt of wages).

I shall consider three social conditions, in relation to fertility and mortality viz:— (in the next Section)

- (1) Illegitimacy.
- (2) Marriage of Minors.
- (3) Occupation of Women.

Section 3.

(A) Illegitimacy

The distribution of illegitimacy in England and Wales is peculiar.

Generally it may be said to be highest in rural, and agricultural districts, but its prevalence, even in those districts, is erratic.

The distribution is, no doubt, due in part to racial differences.

The unmarried women in the Counties south of the Thames,

comprising the descendants of the old Saxon population, have few illegitimate children.

Wales stands next in the scale, the West Midland, the North Western, and the South Midland, covering the area of the ancient Mercia, present less favourable results, while in Yorkshire, the Northern Counties, the North Midland Counties, and particularly the Eastern Counties, covering the area of the ancient Danish population, the number of illegitimate children is excessively great. (Farr (1857) "Vital Statistics").

This explanation is confirmed to a certain extent by the fact that the rate of illegitimacy is highest in those districts where emotional religious revivals are frequent.

Whatever be the cause of the erratic distribution of illegitimacy, it is admitted, that the rate of illegitimacy, depends upon the educational, and ethical standard attained by the people, and upon their social, and industrial condition. As evidence, it may be pointed out, that while the rate of illegitimacy has been falling steadily

and continuously since 1857, the marriages of minors increased until 1886. After that year those marriages have been steadily falling.

Any interference, which tends to place an undue, and artificial restriction on marriages, raises the rate of illegitimacy.

The fall in the number of the ~~mar-~~ marriages of minors was spontaneous—due to alterations in the conditions of life.

From the coincident fall in the rate of illegitimacy, and in the number of marriages of minors, it may be inferred, that a common cause is operating in both cases, to restrict fertility. And inasmuch as the mortality of illegitimate children is universally very high, any decrease in the number of illegitimate births, will tend to reduce the rate of infant mortality, for though the proportion of such children is small, the high rate of mortality prevailing among them, is able to influence the rate of infant mortality to the extent of 5 per. 1000 births.

In 1906 the number of children born out of wed-lock was 37,390.

Infant Mortality. England & Wales. 1906.

	All Infants	Legitimate	Illegitimate
England & Wales	132.50	127.13	261.35
Urban Counties	143.36	137.73	285.41
Rural Counties	108.80	104.83	181.39

Table 23

It may therefore be concluded, that the causes which tend to restrict fertility, tend also to reduce infant mortality. And in point of time, it might be anticipated that the first effect of improved education, and social environment, would be to reduce the proportion of illegitimate births, i.e., before any reduction in legitimate natality, and therefore, before any recorded decrease, in the marriage of minors.

If illegitimacy be taken as the measure of the social condition of the population, the following comparisons between the statistics of two quinquennia, 1871-75, and 1901-05, are instructive. Although the series is not perfectly consecutive, the decrease in mortality recorded is generally

proportionate to the decrease in illegitimacy.

Table 24. England and Wales. 1901-1905.

	Illegitimacy	Infant Mortality
9 Counties	- 30%	- 20%
8 "	- 30%	- (15-20)%
12 "	- 26%	- (10-15)%
9 "	- 30%	- (5-10)%
3 "	- 26%	- (0-5)%
4 "	- 21%	- Increase.

(B) Age at Marriage.

The mean age at marriage of spinsters with bachelors is steadily rising, and fertility is directly proportional to age at marriage, though the exact proportion cannot be measured.

Table 25. England and Wales.

Mean age at Marriage	Bachelors	Spinsters
1896	26.30	24.54
1906	26.76	24.99

The age of the mother exercises more influence than the age of the father. Körösi - discussing the statistics of Buda Pesth - states that

the legitimate natality reaches its climax at the age of 18 and 19 years, and declines above, and below, that point.

Legitimate fertility is however to be regarded as the resultant of two different forces, and the number of children born in a family, is not a consequence of the physical and physiological power alone, but also of the wish and will, to have offspring.

By natality is meant, the probability of a birth during a year, and the following comparative table of female quinquennial natalities, shews how great is the influence of age at marriage, on the birth rate.

Annual Natality per 100 Wives. * Table 26.

	Sweden	Denmark.	Edinburgh
Age of Mother	1891	1880-89	1855
15-19	51.81	71.50	50.00
20-24	45.14	49.37	41.79
25-29	37.53	40.50	34.64
30-34	31.18	31.15	26.56
35-39	25.04	22.98	20.39

* Journal Royal Statistical Society. Dec. 1894.

The influence of age at marriage does not cease with its influence on fertility. It extends to mortality, for which a table of the English statistics is given below:

Table 27.

Marriages of Minors		Average R.I.M.	Diarrhoea	Wasting
15 Counties	160‰	143	25	48
14 "	131-160‰	120	20	44
16 "	130 & under	97	13	38

So that later age at marriage, not only tends to a lower birth rate, but it also directly tends to a reduction in the rate of infant mortality.

The decrease in infant mortality in English Counties 1901/05, compared with 1871/75, is proportional to the decrease in the number of marriages of minors.

Table 28.

No: of Counties	Decrease R.I.M. ‰ 1901/05 and 1871/75	Decrease ‰ in Marriages of Minors.
9 counties	over 20	41
20 "	10 - 20	26
12 "	0 - 10	25
4 "	Increase.	21

Marriages of Minors 1876-80 = 78 males and 217 females.
1906 = 43 " " 146 "

(C) Employment of Women.

I am not at the present concerned to discuss in detail, the influence of the employment of women in industrial occupation, on infantile mortality.

From *à priori* considerations, it would appear probable, that the absence of the mother from home, would result in the neglect of home and children, and that employment in arduous labour during pregnancy, would tend to the birth of immature offspring. Various tables of statistics are published, (see Newman, "Infant Mortality.") by which such a relationship is attempted to be shown, but all are liable to grave criticism.

The following table - the abstract of the Reports of twenty towns for 1908 - though not wholly self consistent, suggests a relation between the rate of infantile mortality and the employment of women.

Employment of Women. 1908.

Table 29.

	10 Towns	6 Towns	4 Towns.
% No. of Women employed	8.0	15.4	30.2
R. I. No.	126	137	144
Common Infectious diseases	6.4	8.1	6.1
Diarrhoeal diseases	21.2	25.5	28.5
Tuberculous "	4.2	6.3	6.1
Syphilis	1.1	1.8	1.4
Nervous diseases	14.4	11.8	13.0
{ Bronchitis	{ 12.1	{ 11.9	{ 15.1
{ Pneumonia	{ 8.2	{ 11.8	{ 11.9
Respiratory diseases	<u>20.3</u>	<u>23.7</u>	<u>27.0</u>
Premature birth	{ 24.0	{ 25.9	{ 29.5
Debility	{ 18.7	{ 20.2	{ 16.7
Wasting diseases	<u>42.7</u>	<u>46.1</u>	<u>46.2</u>

I am however more concerned with the relation of fertility and mortality, and the proportion of women employed, and in the following two tables, I illustrate the difference between the birth rates, and mortality rates, in two groups of towns. In one group, twice as many women are employed as in the other group.

(a) Metals Towns. 1891-1900. Table 30

	Women married and widowed. 15.457	Birth Rate.	R. I. No.
Gateshead	6.4	36.55	174
Sunderland	7.7	36.56	176
Sheffield	11.0	36.49	195
Newcastle-on-Tyne	8.2	33.87	173
Birmingham	18.9	33.56	200
Wolverhampton	11.9	34.81	188
Bilston.	10.7	36.50	192
Averages	10.7	35.48	185

(b) Textile Towns.

Table 31.

Bolton	15.1	31.79	176
Blackburn	37.9	29.98	186
Oldham	20.0	28.62	178
Burnley	33.8	32.20	186
Bradford	18.1	26.34	175
Huddersfield	12.9	23.92	145
Halifax	12.4	24.18	145
Averages.	21.5	28.16	170.

It is seen (1) that the birth-rate is much higher in the non-textile towns, and (2) also, that the rate of infantile mortality is higher in those towns, although (3) the proportion of women

employed is only half, the proportion employed in the textile towns.

It would therefore appear as if the birth rate were of greater importance in influencing the rate of infantile mortality, than the proportion of women employed.

Section 4.

It remains now, to consider why the rate of infantile mortality in England and Wales remained high - and even increased - while the birth rate was diminishing.

Reference to Chart No: 1 shews how great are the annual variations, but if the Rate of infant mortality be considered for a series of years, for quinquennial periods, it will be seen, that the rate of infantile mortality began to fall in the period 1871-75, and continued to fall until 1886-90, when an increase was recorded. An increase was recorded during three quinquennia, but in 1901-1905, the rate fell to the low level it had reached in 1881-1885.

Analyses of the statistics for the various registration Counties shows, that the increase was recorded in every part of the country, and was not therefore due to any local causes.

If the quarterly rates of infantile mortality be studied, it is found, that the greatest variations occur in the rates of the third quarter, and it is also to be observed, that large variations, are almost exclusively confined to that quarter.

I have therefore charted the R. I. M. for the third quarter 1870-1906, and it will be seen that high rates prevailed, (with the exception of 1894) from 1893 to 1901.

The variations in the rate of infantile mortality in the third quarter, have been found to be associated with a high earth temperature, and a low rainfall. While not at present concerned in tracing the causes of this association, it may merely be mentioned, that high mortality in the third quarter, and rainfall, is related to, the epidemic prevalence of diarrhoea;

Chart 7.

R. I. M., Temperature and Rainfall - 1881 - 1905

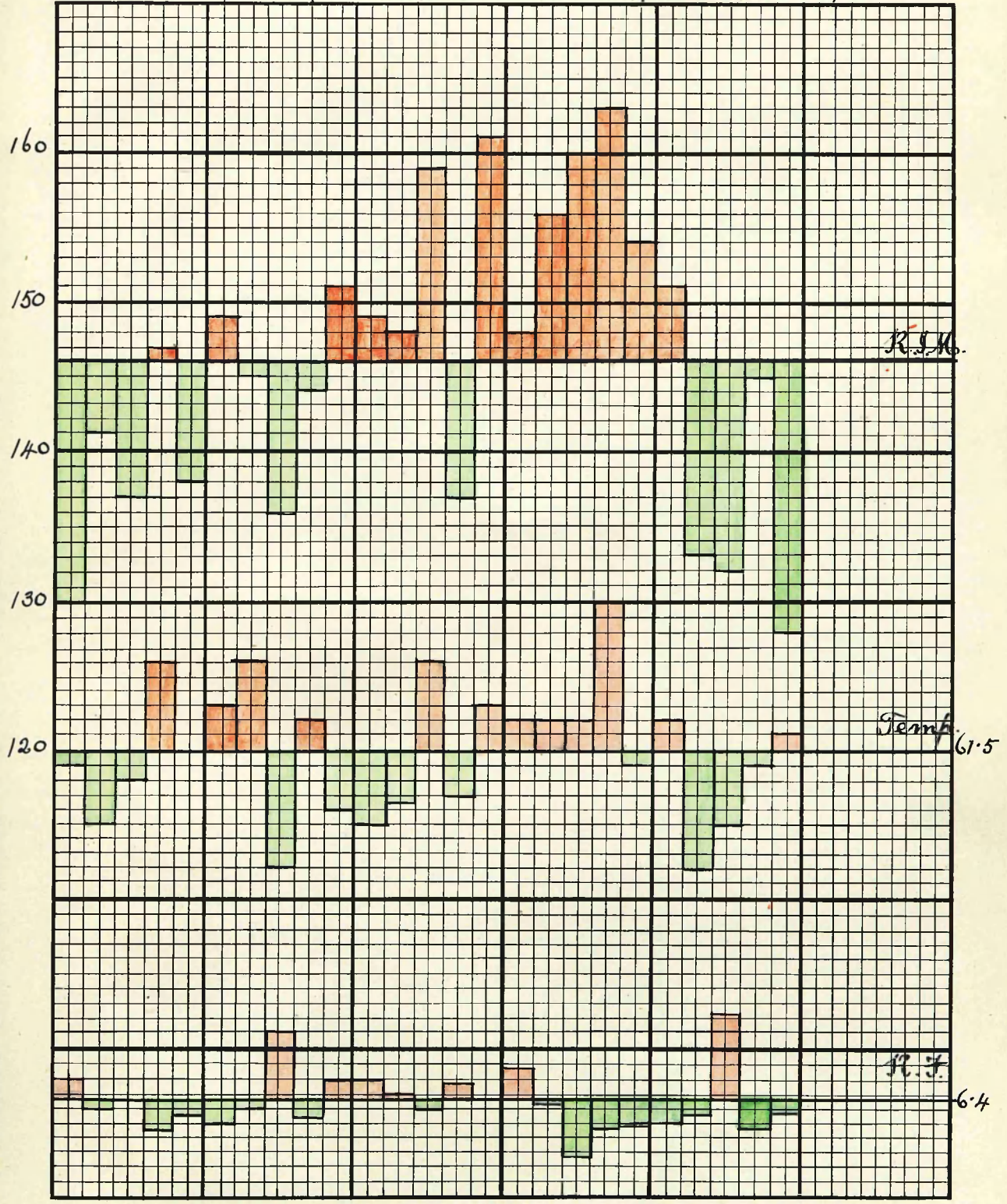


Chart 8.

Third Quarter R.S.M. 1870-1906.

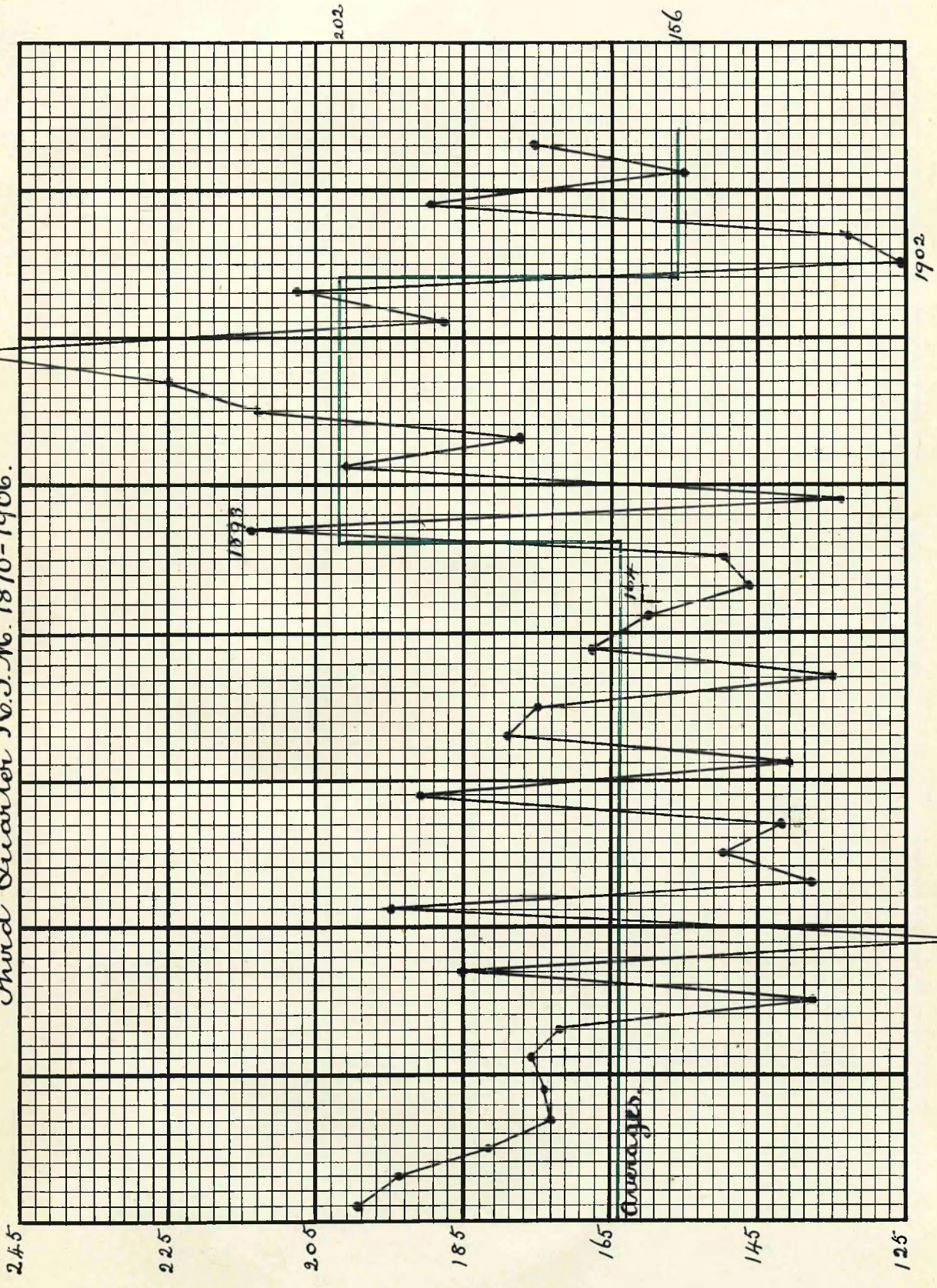


Chart 9.

Third Quarter Rainfall 1870-1906.

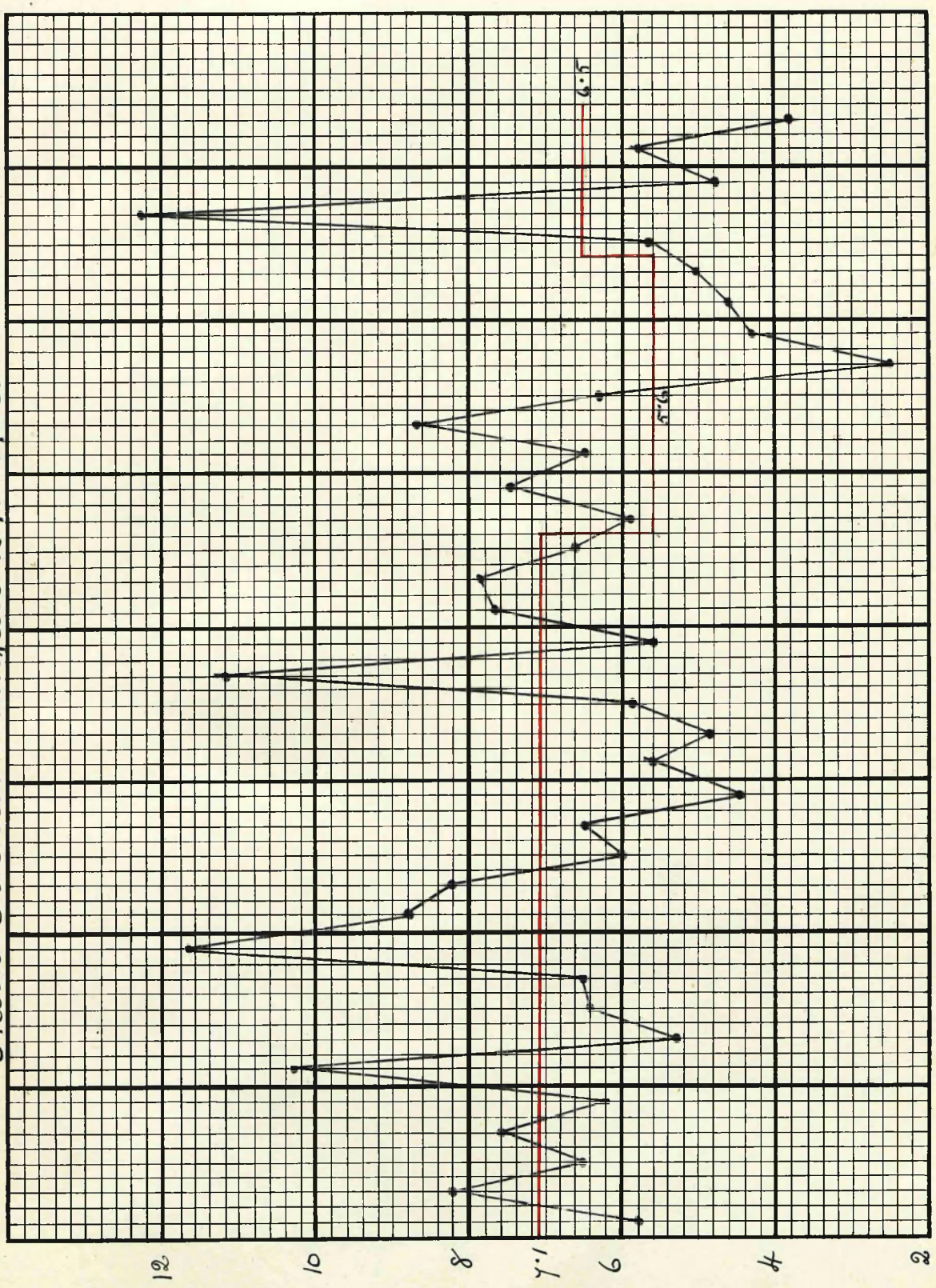
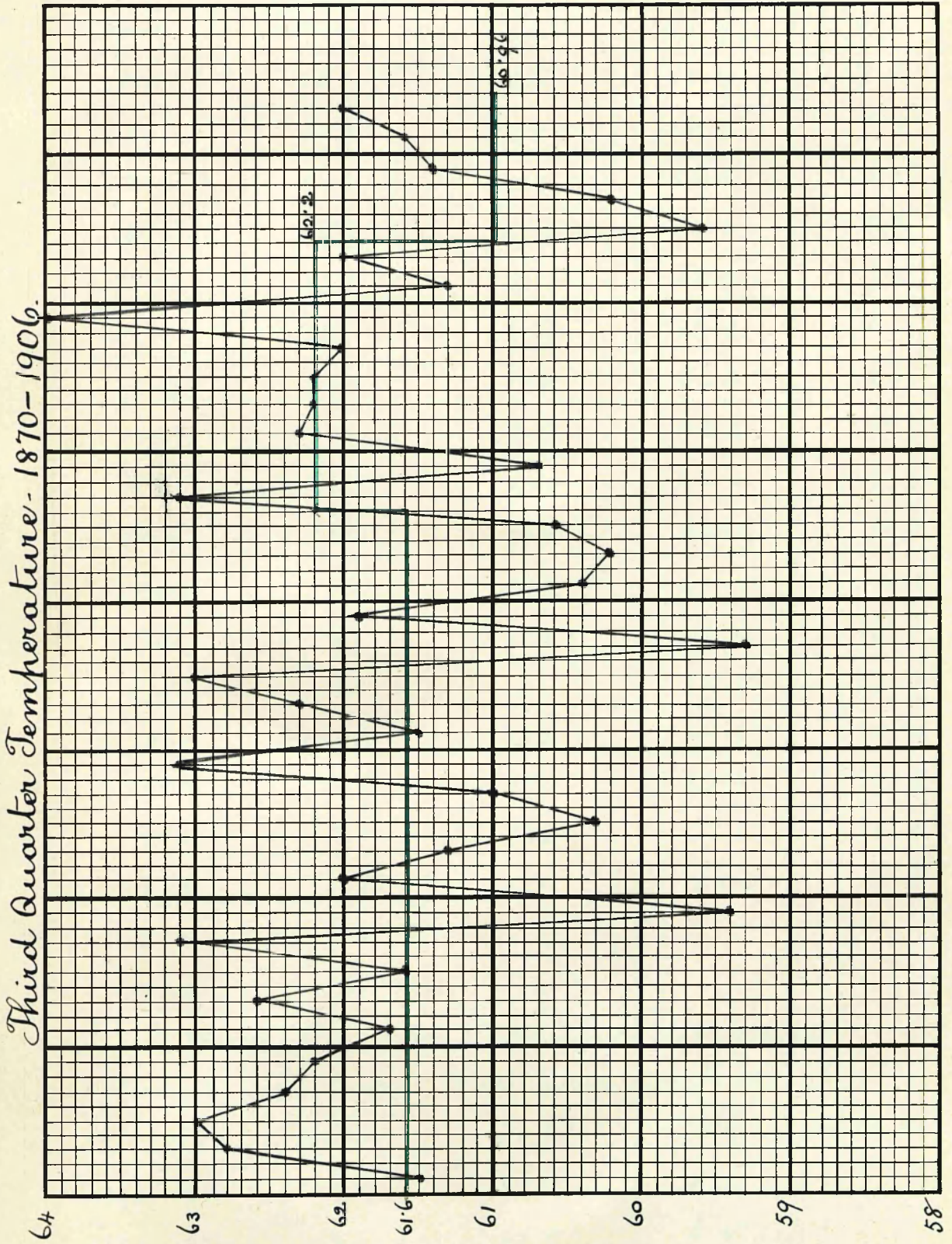


Chart 10.



Third Quarter Statistics.

Table 32.

Year	annual R. I. M.	R. I. M.	Temperature	Rainfall
1889	144	166	61.9	5.6
1890	151	160	60.4	7.7
1891	149	146	60.2	7.9
1892	148	150	60.6	6.6
1893	159	214	63.1	5.9
1894	137	134	60.7	7.5
1895	161	201	62.3	6.5
1896	148	178	62.2	8.7
1897	156	213	62.2	6.3
1898	160	225	62.0	2.5
1899	163	233	64.0	4.3
1900	154	188	61.3	4.6
1901	151	208	62.0	5.1
1902	133	125	59.6	5.7
1903	132	133	60.2	12.3
1904	145	190	61.4	4.8
1905	128	155	61.6	5.8
1906	132	176	62.0	3.8
1907	118			
1908	121			

Third Quarter Statistics - Averages.

Period	R. I. M.	Temperature	Rainfall.
1870-1892	164	61.6	7.1
1893-1901	202	62.2	5.6
1902-1906	156	61.0	6.5

Table 33.

England and Wales.

Table 34

Period	Birth Rate	Death Rate	R. I. M.
1838-42			152
1847-50			154
1851-60	34.1	22.2	154
1861-70	35.2	22.5	154
1871-80	35.4	21.4	149
1881-90	32.5	19.1	142
1891-1900	29.9	18.2	154
1871-75	35.5	22.0	153
1876-80	35.4	20.8	145
1881-85	33.5	19.4	139
1886-90	31.4	18.9	145
1891-95	30.5	18.7	151
1896-1900	29.3	17.7	156
1901-05	28.1	16.0	138

Third Quarter Statistics.

Table 35

Year	R. I. M. Annual	R. I. M.	Temperature	Rainfall.
1870	160	200	61.5	5.7
1871	158	194	62.8	8.2
1872	150	182	63.0	6.5
1873	149	173	62.4	7.6
1874	151	174	62.2	6.2
1875	158	176	61.7	10.3
1876	146	172	62.6	5.3
1877	136	138	61.6	6.4
1878	152	185	63.1	6.5
1879	135	115	59.4	11.7
1880	153	195	62.0	8.8
1881	130	138	61.3	8.2
1882	141	150	60.3	6.0
1883	137	142	61.0	6.5
1884	147	191	63.1	4.5
1885	138	141	61.5	5.6
1886	149	180	62.3	4.9
1887	145	175	63.0	5.9
1888	136	135	59.3	11.2

but if the temperature statistics for the period 1870-1906 be analysed, the following table is obtained.

Table 36.

Period	R.S. No.	Temperature	Rainfall.
1870-1902	164	61.6	7.1
1893-1901	202	62.2	5.6
1902-1906	156	61.0	6.5

Omitting the returns for 1894, the mid-period yields the following averages.

1893-1901 (omitting 1894) 210. 62.4. 5.5

It is at once apparent, that the period during which increased infantile mortality was recorded, was characterised by a high earth temperature and a low rainfall, conditions favourable to the epidemic prevalence of diarrhoea.

It is well known, that the epidemic prevalence of disease, is least under control of all forms.

The increased mortality during the period 1893-1901 therefore, was due to climatic conditions, and thus may

be regarded as accidental.

And with the lower temperature, and higher rainfall, that has prevailed since 1901, there has been a fall in the rate of infantile mortality, so that the average rate, for the seven years 1902-1908, is slightly under 130, the lowest previous rate, for a quinquennium, being 138. For the quinquennium 1904-1908, the rate was 129.

Conclusion.

To sum up, I have endeavoured in the previous pages to shew, that the Rate of Infantile Mortality is determined by social, economic, and climatic conditions, and as a corollary it follows - that any attempt to effect directly any diminution in the rate by special schemes, for the preservation of infant and child life, must be futile.

The fall in the Rate of Infantile Mortality during the present century, coincident it is true, with more or less organised philanthropic

efforts such as, the supply of sterilised milk for infants from Municipal depôts, the feeding, and in some cases, also the clothing of school children, visitation of the homes by Health Visitors and trained Nurses, the Notification of Births Act, and the Medical Inspection of school children, and many others - all beneficent in themselves, yet inefficient - hopelessly inefficient - in circumventing what is due to the action of natural law.

To such philanthropy, some meed of praise must be given, and in time it will yield a harvest of success - not by its influence - but by leavening the dough. mass

Summary of Contents.

Introduction p. 1 to 14.

Section 1. p. 15.

¶ 1. Consideration of International Statistics, (Registrar-General's Annual Returns) showing that a falling Birth Rate is always associated with a falling Rate of Infantile Mortality, and with an increase in the B.R. there is a coincident rise in the R.I.M.

Comparison of the 2 quinquennia 1881/85, and 1901/05. Out of 22 countries included there was a fall in the B.R. in 18, and an increase in 4 only; and a fall in the R.I.M. was recorded in 16, and a rise in 6 only.

¶ 2. Dealing with the Statistics of England and Wales alone, it was found that no relation exists between the B.R. and the R.I.M., and no relation was to be anticipated, as the fall in the B.R. has been progressive.

Coefficient of Correlation between the B.R. and R.I.M. which shews that mathematically there is no interdependence between the Annual Variations.

Section 1. cont.

¶ 3. (p. 18) Birth Rate and R.I.M. for decennium 1891-1900. (England and Wales.)

Division of England and Wales into 635 Registration areas, and their relation to Parliamentary and Municipal divisions.

Analysis of the 635 Registration divisions. (with Tables. p. 19) The R.I.M. is found to increase with the B.R. in every group of districts except one. Method of obtaining the B.R.s.

¶ 4 (p. 20) Methods of estimating Fertility. ①. By the B.R. ②. by calculating as a rate per 1000 married women, aet. 15-45 years. ③. or per 1000 females living, between the same ages. Registrar-Generals method.

Analysis of the statistics of the English Counties for decennium 1891/1900 to test the relation-if any-between Fertility and Infantile Mortality. It was found that a high degree of Fertility is associated with a high R.I.M.

¶ 5. p. 21. Two series of Registration districts were taken for analysis. For the first series, all those districts were taken, in which the decennial births exceeded

Section 1. contd

40,000 in number; and for the second series, all the districts with decennial births ranging from 10,000 to 20,000. (see Tables 6. & 8.)

The analysis of the first series does not show any very close association between Fertility and the R.I.M. (partly due to a few of the districts having rates abnormally removed from the average.)

The coefficient of correlation showed a considerable degree of correlation to exist.

The association of high mortality with high Fertility, though the converse is not so invariable, but very low fertility is associated with low mortality.

The analysis of the second series (i.e. districts with decennial births 10,000 to 20,000) yielded more striking results. The average mortality of 22 districts, with fertility Rates from 131 to 140, is the single exception to a regular series.

The coefficient of correlation was distinctly higher between the two rates, than that obtained in the first series.

Section 1. contd

¶ 6. (p. 32). The coefficient of Correlation between the Fertility and R. I. No., was also calculated in the 16 districts into which the County of Staffordshire is divided, and was higher than in either of the previous series.

In 9 districts in which the Fertility Rates were higher than the average, the average R. I. No. was 167.5, compared with 136 in the 7 districts, in which those rates were lower.

In 9 districts in which the Mortality rates were lower than the average, the Fertility was 141, as compared with 158 in the 7 districts in which the mortality rates were higher than the average.

¶ 7. (p. 35.)

Having established that a general relation exists between Fertility and Infantile Mortality, investigation was made to ascertain, whether any relation could be shown to exist, between the fall observed in the two rates during recent years.

¶ 8. (p. 35.)

With this end in view it was determined, in the 22 Counties of which

Section 1. contd.

statistics are available, what was the measure of the average variation recorded in the two rates; and then the coefficient of correlation was calculated, which was found to be, 0.62 ± 0.009 ; showing that not only are the two rates causally related; but also, that they are quantitatively related.

¶ 9. (p. 36)

Comparison was further made of the percentage fall in the two rates in English Counties, using the mortality statistics for the two quinquennia, 1871/1875, and 1901-1905; and the fertility rates for 1870/1872, and 1903/1905.

In all the Welsh Counties except, - Montgomery and Flint, - an increase in mortality was recorded, and an increase also occurred in 2 English Counties, viz. Essex and Monmouthshire. (latter more properly included with Welsh Counties.)

The result of the analysis of the statistics, of the 41 Counties in which a fall in the Mortality was recorded, is set out in the Tables on page 37.

Section 1. cont^d

¶ 10. (p. 37)

Using the data for the 55 Registration Counties into which England and Wales is divided, the coefficient of correlation between the percentage decrease in the rates is found to be, - $r = 0.386 \pm 0.067$; while if the Welsh statistics be excluded, the Coeff. of Correl. for 43 English Counties is, - $r = 0.51 \pm 0.08$.

Less reliance can be placed on the Welsh figures. (see p. 41) Increase of Mortality in Wales, its significance, and its causes.

Section 2. (p. 43)

In the preceding Section an attempt has been made to prove ① that high fertility, and high Infantile Mortality, and vice versa, are associated together, and ② that the relation between Fertility and Mortality is not merely casual.

It has now to be considered whether any sufficient explanation of the relationship can be offered.

Section 2 contd

¶ 1. (p. 43)

Consideration of the question of Fertility being lower among the higher orders of Society than among the lower. Evidence:-

① Bertillon's statistics for Norway dating back from 1851, at a period before the B.R. began to fall. ② Drysdale's statistics, 1888, of Parisian fertility. ③ Bertillon, a Table of Fertility Statistics quoted from Kaulhalls "Dictionary of Statistics." ④ from statistics of the different wards into which towns are divided, with certain reservations (eg. comparison of age, and sex constitution, of the population in the two districts.)

an analysis of 2 such divisions - one working class, and one wealthy residential division in City of Liverpool is given on p. 44. Also a table of a similar nature of the Borough of Southport.

Doubledays "Law of Population":-
"that Fertility diminished with the ease with which a supply of food is obtained." (Wealth.) The Tables on page 44 substantiate this.

Section 2. contd

¶ 2. (p. 45.)

The influence of Wealth and Social position in regard to Infantile Mortality considered.

In a "Report on the Sanitary Condition of the Metropolis" - 1843 it was found that the R.I.M. among the professional classes was only 1 in 10; of tradesmen 1 in 6; and of working classes 1 in 4.

In Ansell's "Statistics of Families" 1874, the R.I.M. of professional classes was only 80, while of the non-professional classes, it was 150.

More recent statistics from Rowntree's "Poverty", 1901, are stated in a table on p. 45.

¶ 3. (p. 46)

Discussion of the persistent tendency of wages to increase during the last 50 years in all branches of trade. Evidence of which may be obtained from an L.S.B. Report 1909 ("Public Health, and Social Conditions.") Apparent increase of over 80% in the average rate between 1850 and 1907. Average rate of wages

Section 2. contd

1900-07, was to the average rate 1860-67 as 140:100 (a rise of 40% in 40 years.)

Consideration of the average price of articles in common use, and averaging the wholesale prices, it is found that the average of prices in the period 1897-1907, is 24% lower than in the period 1850-1860. Therefore real increase in wages, is materially greater than in the bare rate of money wages, when purchasing power of money, - as measured by the average wage, is taken into consideration.

¶ 4. (p. 47)

Pauperism considered in relation to Mortality.

The decline of Pauperism since 1860. On p. 47 is given a table of statistics showing the decline. (L. G. B. Returns) Causes of the decline.

The increase in the rate of wages, and the decline in pauperism, indicate that the general population has attained a higher standard of comfort and luxury, than formerly, which conduces to low mortality.

Section 2 contd

Coincidentally with growth of comfort, a continuously falling B. R. is being recorded.

The association between low fertility and low mortality, may depend on the latter, (i.e. directly dependent, or related to, increased wealth and desire for comfort) or, it may be due to the increased care of child life during recent years, with the object of saving waste of infant life, but these two views resolve themselves into one more comprehensive explanation viz: that fertility and Mortality are determined by the economic value of the child, and the relation of the latter to the comfort of the parents.

Consideration of the economic value of the child. The employment of children in factories etc.

Section 3. (p. 30)

Consideration of three social conditions in relation to Fertility and Mortality - viz: 1. Illegitimacy
2. Marriage of Minors and ^{age at marriage} 3. The Occupation of Women.

Section 3. cont'd

¶ A (p. 50) Illegitimacy

Illegitimacy considered in relation to Fertility and Mortality.

Its distribution, generally highest in rural and agricultural districts, but even here erratic. Partly determined by Racial differences.

The rate of illegitimacy is highest in those districts where emotional religious revivals are most frequent.

The rate also depends upon the educational and ethical standard attained by the people, and upon their social and industrial condition. Proof of this.

The rate is further influenced by the number of marriages of minors.

Its relation to Fertility is restrictive at present, and further, any decrease in the number of illegitimate births tends to reduce the R.I.M.

The number of illegitimate born in 1906 was 37,390. see table p. 53.

Illegitimacy discussed as the measure of the social condition of the population, with statistics.

Section 3 contd

¶ B. (p. 54)

Age at Marriage.

Mean age at marriage of spinsters with bachelors is steadily rising, and Fertility is directly proportional to age at marriage. Statistics for England and Wales. Age of father and mother, and its relative influence. Legitimate fertility - factors concerned.

Natality defined. Table to show how great is the influence of age at marriage, on the birth rate. (Journal Roy: Statistical Society.)

The influence of age at marriage further extends to mortality. See table p. 56, which shows that later age at marriage tends directly, to a reduction in the R.I.M.

The decrease in the R.I.M. in English Counties 1901/05, compared to 1871/75, is proportional to the decrease, in the number of marriages of minors. (Table p. 56)

¶ C. (p. 57)

The Employment of Women.

Its relation to the R.I.M. briefly discussed. A Table which suggests such a relation is given on p. 58. Its relation to birth of immature offspring.

Section 3. contd

Relation of Fertility and R.I.M. to the proportion of Women employed. Two tables bearing on this, one of a "Metal" town, the other of a "Textile" town, are set out on p. 59. Conclusions - it appears, that the Birth Rate is of greater importance in influencing the R.I.M. than the proportion of women employed.

Section 4. p. 60.

It remains to consider why the R.I.M. in England and Wales remained high, and even increased, while the Birth Rate was diminishing.

Annual variations of the R.I.Ms. are very great. (see. Chart No. 1). R.I.M. considered for quinquennial periods. Began to fall in period 1871-75, and continued falling until 1886-90, when an increase occurred. An increase took place during 3 quinquennia, but in 1901-05 the R.I.M. fell to the low level it had reached in 1881-85.

Analysis of the statistics shows, that the increase was general throughout every

Section 4. contd

part of the country, therefore it was not due to local causes.

Study of the quarterly R.I.M., shows the ~~the~~ greatest variations to occur in the 3rd quarter, and it is further noticed, that large variations are confined to this quarter. Charts of this quarter, (3rd quarter 1870-1906) have therefore been drawn up, and reference to these will show, that high rates of infantile mortality prevailed from 1893 to 1901. (exc. 1894)

The variations in the R.I.M. in the 3rd quarter are associated with, (1) high earth temperature, and (2) with a low rainfall. High mortality in the 3rd quarter, and rainfall, is related to the epidemic prevalence of diarrhoea.

If the temperature statistics for period 1870-1906 be analysed, the figures given on p. 68 are obtained.

It is at once evident that the period during which increased R.I.M. was recorded, was characterised by a high earth temperature, and a low rainfall, conditions favourable to the epidemic prevalence of diarrhoea.

Section 4 contd

The epidemic prevalence of disease, is least under control of all forms.

The increased R.I.M. during period 1893-1901 therefore, was due to climatic conditions, and thus may be looked on as accidental.

With the lower temperature and higher rainfall prevalent since 1901, there has been a fall in the R.I.M., so that the average rate for the 7 years 1902/1908, is slightly under 130, the lowest previous rate for a quinquennium, being 138. For quinquennium 1904/1908, the rate, was 129.

Conclusion

To sum up, an endeavour has been made in this essay to prove, that the Rate of Infantile Mortality is determined by social, economic, and climatic conditions, and as a corollary it follows, that any attempt to effect a direct diminution in the rate by special schemes, must fail, and that ^{such} schemes, although beneficent in themselves, and calculated ~~as~~ such, to prove useful, are powerless, to cope with what is due to the action of natural law.

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